

BIRDS OF GOOSEBERRY HILL

by MICHAEL BROOKER

CSIRO Sustainable Ecosystems, Wembley, Western Australia 6913

ABSTRACT

Biological information is presented for 96 species of birds found on or near the Darling Scarp on the southern side of Helena Valley, Western Australia between 1984 and 1998. I have endeavoured to relate the distribution and abundance of the birds to habitat, season and the occurrence of wildfire. However, interpretation of the observed spatial and temporal patterns of occurrence for many species, be they sedentary, migratory or nomadic, was made more difficult by the high fire frequency, even with 15 years data available for comparison.

Nevertheless, some conclusions can be made. I have been able to identify a suite of sedentary species that seem able to withstand a very high fire frequency. While some species such as Western, Yellow-rumped and Inland Thornbills appear to have declined, their drop in numbers has not been nearly as great as for Splendid Fairy-wrens, which declined by 80%. The long-term persistence of fairy-wrens in this area now relies on the permanent connection of the heathland to undisturbed, larger areas of similar habitat and the same probably applies to the other heath-dwelling species. An additional threat to the long-term survival of such species is the continued increase of introduced plants; eg. the choking of preferred nesting sites such as gullies by *watsonias*.

While the major tree species (Marris and Wandoo) continue to regenerate after fires, the gradual loss of mature and dead trees to fire may be detrimental to those bird species that rely on hollows for breeding and roosting. A prime example is the Owlet Nightjar, which is now locally extinct.

Gooseberry Hill and surrounding areas have considerable intrinsic and extrinsic conservation value. We now have a long-term and detailed baseline inventory of faunal and floral information, besides which the area forms the only remaining connection between the last large remnant of the Ridge Hill Shelf Landform and the Scarp, where it adjoins the forests of Kalamunda National Park.

METHODS

In this paper I document the results of bird observations made on Gooseberry Hill and surrounding areas since 1984.

Over fifteen years (1984 - 1998) a large body of bird breeding data was accumulated, most notably for cuckoos, thornbills, scrubwrens, woodswallows

and robins, as well as wrens. The depth of study varied considerably between species and over time, ranging from the colour-banding of all adults and nestlings of some species, to a simple record of presence/absence for other species (Table 2). Accordingly, the effort expended on the study (number of hours of observation) also varied between and within years (Figure 3). The impact of these differences is taken into account when discussing differences in the occurrence of species. Naturally, much more information could be obtained from species with large numbers of individually colour-banded birds (Table 3). Morphological measurements (Appendix 1) were taken from birds that were mist-netted. Egg measurements for 14 species are shown in Appendix 2.

The late Dr. Dom Serventy kept records of birds at his residence, the Knoll (Figure 1, site 6) in the form of an unpublished, annotated list for the

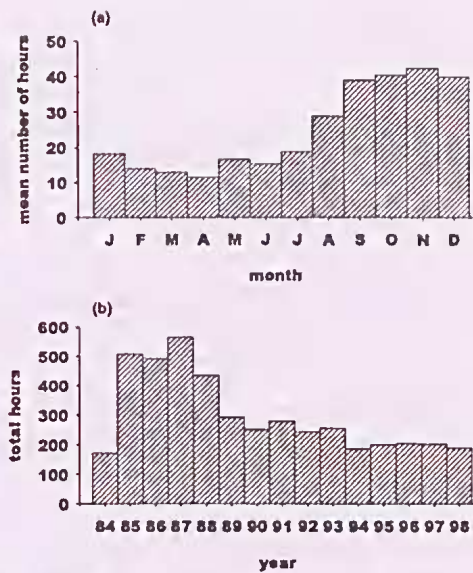


Figure 3. Amount of effort expended according to (a) month and (b) year.

period 1957 - 1974, and in notebooks held by the WA Museum. I make reference to these observations, where relevant.

Table 2. Types of bird observations made

Species	Period	Type of observations
Splendid Fairy-wren	1973-1989	Adults and nestlings colour-banded, nests located, censused January, July and September
	1990-1998	Censused in spring, some adults and nestlings colour-banded
Western Thornbill	1984	Some adults and nestlings colour-banded, most nests found
	1985-1989	Adults and nestlings colour-banded, nests found
	1990-1995	Some adults and nestlings colour-banded, some nests found, censused in spring.
Yellow-rumped Thornbill Scarlet Robin	1985-1998	A few birds colour-banded, nests found, breeding density estimated
Cuckoos	1984-1998	Nestlings and some adults colour-banded Location, time and type of call recorded
Migrants and Nomads	1984-1998	Location recorded
Raptors	1984-1998	Time, location and number recorded
Other species	1984-1998	Presence/absence recorded each visit Details recorded for rare and vagrant species

Table 3. Numbers of birds banded.

Species	Colour banded		Metal Banded Only		Total
	Adults	Young	Adults	Young	
Fan-tailed Cuckoo	5	3	-	-	8
Horsfield's Bronze-Cuckoo	8	62	-	9	79
Shining Bronze-Cuckoo	9	34	1	-	44
Splendid Fairy-wren	277	1431	-	-	1708
Red-winged Fairy-wren	2	9	-	-	11
Striated Pardalote	10	-	8	-	18
White-browed Scrubwren	43	33	6	-	82
Weebill	10	3	-	-	13
Western Gerygone	9	2	-	3	14
Inland Thornbill	17	13	-	-	30
Western Thornbill	222	319	10	90	641
Yellow-rumped Thornbill	48	101	11	37	197
Brown Honeyeater	-	-	161	69	230
Tawny-crowned Honeyeater	23	15	-	20	58
Western Spinebill	60	2	19	-	81
Scarlet Robin	12	16	-	-	28
Red-capped Robin	9	2	-	-	11
Golden Whistler	3	-	3	-	6
Rufous Whistler	22	2	-	-	24
Grey Shrike-thrush	1	3	-	-	4
Grey Fantail	9	-	5	2	16
Willie Wagtail	4	2	-	-	6
Dusky Woodswallow	21	29	-	-	50
Grey Butcherbird	4	3	-	-	7
Red-browed Finch	5	3	-	4	12
Mistletoebird	-	-	6	-	6
Silvereye	-	-	192	78	270
	833	2087	422	312	3654

SPECIES ACCOUNTS

Emu Dromaius novaehollandiae

One Emu was recorded on Gooseberry Hill on 17 December 1985 (June Butcher pers. comm.).

Australian Shelduck Tadorna tadornoides

Seen occasionally along Helena River from July to September.

Australian Wood Duck Chenonetta jubata

Flocks of up to 50 seen on the dam at the Lab. Pairs nested on Gooseberry Hill and in the Lab grounds in hollows in Wandoo and Marri trees. Newly hatched ducklings were seen on 1 October 1985 (8); 15 October 1989 (6); 2 September 1992, 23 September 1993 (8) and 21 August 1995 (6).

Pacific Black Duck *Anas superciliosa*
Common along the Helena River in winter; some pairs nested on the ground under heath on Gooseberry Hill; one such nest was 1.5 km from the river. Ducklings were seen from August to October.

Darter *Anhinga melanogaster*
Occasionally seen flying along the Helena River.

Little Pied Cormorant *Phalacrocorax melanoleucos*
Occasionally seen along Helena River.

White-faced Heron *Egretta novaehollandiae*
Seen often along the Helena River and in the Lab grounds where a pair nested in 1986.

White-necked Heron *Ardea pacifica*
One record on the river, 19 July 1985.

Great Egret *Ardea alba*
One individual seen on Helena River on 22 January 1990.

Nankeen Night Heron *Nycticorax caledonicus*
A juvenile was seen near a pool in the Helena River on 2 March 1993.

Australian White Ibis *Threskiornis molucca*
Seen infrequently along Helena River and on the dam at the Lab.

Straw-necked Ibis *Threskiornis spinicollis*
Several were seen in October 1987.

Black-shouldered Kite *Elanus axillaris*
Seen in all months of the year except March. Most often seen from July to October (63% records, n = 46). Only 20% of all records were actually on

Gooseberry Hill, the rest were made in cleared habitat, especially that along Ridge Hill Road.

Square-tailed Kite *Lophoictinia isura*
Recorded on 34 occasions, mainly between August and November, with only two records since 1994. Thirty-two of the records were of single birds. At 1020 h on 18 August 1987, a Square-tailed Kite, flying at about 100 m above ground, was harried by two Australian Ravens. One Raven grasped the tip of the Kite's left wing and the two started to circle. The second Raven then landed on the Kite's back and all three tumbled toward the ground for several seconds before parting company.

Whistling Kite *Haliastur sphenurus*
No records of Whistling Kites were made during my survey period. Serventy reports that they were "not often seen" during his observations from 1957 to 1974; Mawson and Massam (1995) give one record (January 1992) for Forrestfield for the period 1991 - 1992.

Brown Goshawk *Accipiter fasciatus*
During 15 years, Brown Goshawks were observed on 89 occasions, with another 36 sightings which were either Brown Goshawks or Collared Sparrowhawks. Forty-seven of the Brown Goshawk sightings (53%) were made in October and November.

One nest was found in a tall Marri near the Helena River in September 1986. An unsuccessful attack on a Laughing Turtle-Dove was observed in October 1987.

Collared Sparrowhawk *Accipiter cirrhocephalus*
Collared Sparrowhawks were recorded less frequently (n = 36) than Brown Goshawks, with 78% of sightings made between September and January.

Individuals were seen feeding on Brown Honeyeaters on two occasions.

In February 1997, a sparrowhawk and an adult Red Wattlebird took it in turns to chase one another over a 15 minute period. When the raptor perched, the wattlebird taunted it. Subsequently, a wattlebird nest with large nestlings was found nearby. In January 1999, a juvenile sparrowhawk unsuccessfully chased some Australian Ringnecks and a fledgling Red Wattlebird in the same area for 20 m. A female was observed plucking a Spotted Turtle-Dove on 14 May 1999.

Wedge-tailed Eagle *Aquila audax*

Seen occasionally on Gooseberry Hill (108 occasions over 15 years). Seen most often in summer to early autumn (December - March); least often in spring (September - November). Most individuals that could be aged (77% of 144 sightings) were dark adults, 6+ years of age (Ridpath & Brooker 1986).

Little Eagle *Hieraaetus morphnoides*

Little Eagles were the most frequently observed raptor, seen on 158 occasions (c.f. DeIl 1971). Most records (63%) were from September to November. Often the bird or birds were being harried by other species, mainly Australian Ravens (52%), Australian Magpies (34%) or both (7%). Other species included a Peregrine Falcon (twice), Nankeen Kestrel (once), male White-winged Triller (once) and a Dusky Woodswallow (4 times).

Fledglings were recorded in January 1988, December 1988 and October 1997. One female, who was missing most of the flight feathers on her right wing, was seen over Gooseberry Hill on 11 occasions from 30 August 1987 to 12 November 1987.

Brown Falcon *Falco berigora*

Not common. Single birds recorded on 25 occasions in 15 years, with records in all months of the year except March. Serventy made only two records, in July 1964 and June 1972. Fledglings were seen in Scott Street, Helena Valley in November 1985.

Australian Hobby *Falco longipennis*

There were no confirmed sightings of this species, although five sightings of distant birds were either Australian Hobbys or Peregrine Falcons. Serventy saw two (June 1965 and November 1971) during the period 1957 - 1974 and Mawson and Massam (1995) recorded it at Forrestfield (c. 6 km south-west of Gooseberry Hill) in September and October each year from 1990 to 1992.

Peregrine Falcon *Falco peregrinus*

Peregrine Falcons were recorded on 42 occasions spread throughout the year. They were seen to harry Little Eagles and Wedge-tailed Eagles. Observed eating or chasing Rock Doves (3), Laughing Turtle-Dove (1) and a Fan-tailed Cuckoo (1).

Nankeen Kestrel *Falco cenchroides*

One or more kestrels were recorded on 140 occasions, most often (74%) from September to December, with only one sighting in March, one in April and two in May. Ninety-two percent of sightings were of single birds. A juvenile male netted on 7 May 1986 was marked with a wing window. He was seen again on four occasions, the latest on 31 December 1986.

Spotless Crake *Porzana tabuensis*

One individual was found dead on Gooseberry Hill Rd on 18 August 1987.

Little Button-quail *Turnix velox*

Little Button-quail were present on Gooseberry Hill in considerable numbers between October 1985 and January 1986, when they nested on the area that had been burnt the previous January. A nest with four eggs was found on 18 October 1985, three of which hatched on 2 December.

Painted Button-quail *Turnix varia*

Observed throughout Gooseberry Hill, mainly from November to March; no records in April or June. Painted Button-quails were most abundant in the years following fire. They appeared to decline as the vegetation recovered, becoming rare by 1992, 8 years after the 1985 fire. Serventy found a nest in October 1964. During this study, breeding was observed on 20 December 1985 (2 runners) and 9 December 1988 (2 eggs).

Rock Dove *Columba livia*

Seen in cleared country along the Helena River and, very occasionally, flying over heathland habitat. They nested each year in a large dead Wandoo tree near the Helena Valley Primary School and, in 1998, in a large dead Marri on the northern edge of Gooseberry Hill.

Laughing Turtle-Dove *Streptopelia senegalensis*

Present in suburbia and occasionally seen in heathland, mainly from September to January. During the study period, the numbers seen on Gooseberry Hill (Figure 4) and at Marion Way (Figure 5) have declined, while the numbers of Spotted Turtle-Dove have increased. Eleven breeding records were made, six on Gooseberry Hill and five at the Lab. Nests with eggs have been recorded from 26 August to 17 January,

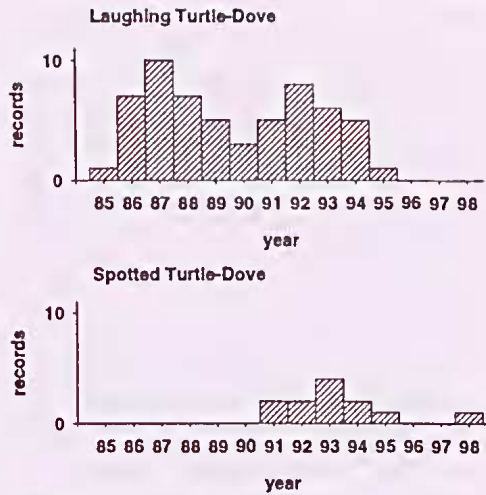


Figure 4. Number of records of Laughing and Spotted Turtle-Doves on Gooseberry Hill 1985-1998.

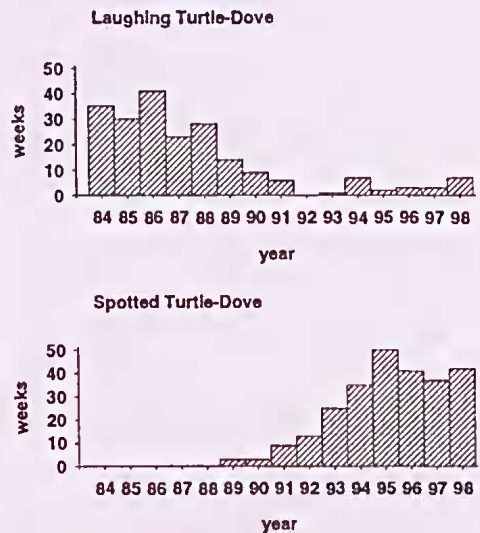


Figure 5. Numbers of Laughing and Spotted Turtle-Doves at Marion Way.

built in native and exotic trees and shrubs (Appendix 3).

Spotted Turtle-Dove *Streptopelia chinensis*

There were no definite sightings of Spotted Turtle-Doves from 1984 to

1989. Since then, the number of observations has increased, while those for Laughing Turtle-Doves have declined (Figures 4 and 5). Spotted Turtle-Doves are now commonly seen at Marion Way and the Lab and occasionally on the northern edge of Gooseberry Hill. A nest with eggs was found at the Lab on 11 January 1995 in an exotic shrub.

The relative frequencies of the two *Streptopelia* spp. in this area appear to fluctuate - during the period 1957 to 1974, Serventy saw more Spotted than Laughing Turtle-Doves.

Common Bronzewing *Phaps chalcoptera*

Recorded in all years, with no evidence of increased abundance on burnt areas following fires in 1985, 1987 or 1994. One nest contained two nestlings on 1 November 1984, another was being built on 2 November 1998 and a fledgling was recorded on 5 December 1991.

Red-tailed Black-Cockatoo *Calyptorhynchus banksii*

Despite being reasonably common in nearby Jarrah forest, Red-tailed Black-Cockatoos were encountered on only four occasions on Gooseberry Hill, once in January and October and twice in November.

Short-billed Black-Cockatoo *Calyptorhynchus latirostris*

Some birds seen in all months of the year on Gooseberry Hill. Short-billed Black-Cockatoos were most frequently recorded from July to October, with very few records for May, November and December. Weekly records from Marion Way showed a similar trend, with birds arriving in January and becoming less numerous from July onwards; only one



Figure 6. Records of Short-billed Black-Cockatoos at Marion Way, 1984-1998.

record for the period October to December (Figure 6).

Observed feeding in heath habitat on *Hakea* spp. from April to August. One group moved through Gooseberry Hill in early September 1988, demolishing the mantles of recently dead *Xanthorrhoea preissii*. On another occasion in July 1986, bark was stripped from a patch of Marri saplings.

Long-billed Black-Cockatoo *Calyptorhynchus baudinii*

Recorded in a mixed flock with Short-billed Black-Cockatoos at the Lab in April (1 record), May (1), June (1), August (4) and February (2) (identifications confirmed by D. Saunders and J. Ingram) and at Marion Way in June (1) and July (1).

Galah *Cacatua roseicapilla*

While Galahs were not observed feeding on Gooseberry Hill, at least five pairs nested there (Figure 7). Of 16 nest trees found in the whole area, four were Marris, two were Flooded Gums and 10 were Wandooos.

Long-billed Corella *Cacatua* sp.

First recorded in the area when a flock of about 40 flew over the Lab on 13 July 1991. Another flock was recorded during 1992 (Aug) and two during 1993 (Aug, Nov). Since 1994, individuals and small groups of birds

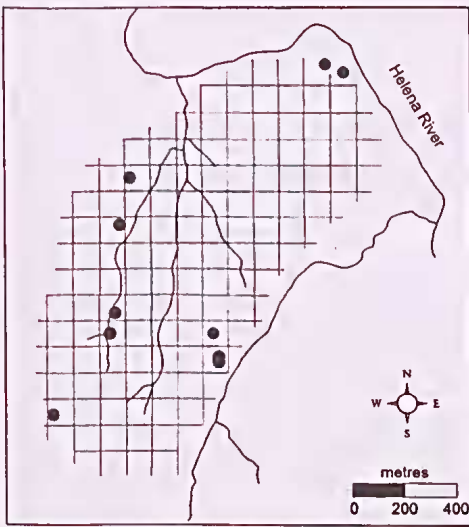


Figure 7. Locations of nest trees used by Galahs on Gooseberry Hill, 1984-1998.

have been regularly recorded flying up and down Helena Valley from mid-June to early December, presumably commuting between nesting and feeding areas.

Sulphur-crested Cockatoo *Cacatua galerita*

Single bird or pairs were recorded on six occasions (23 Nov 1985, 1 Nov 1986, 16 Sep 1987, 1 Nov 1987, 3 Dec 1988, 30 Nov 1989). None have been recorded since.

Rainbow Lorikeet *Trichoglossus haematodus*

Serventy gives an early record for 11 April 1972 at the Lab. During the period 1984-1998 they were recorded on only two occasions on Gooseberry Hill, in December 1991 and June 1998. More recently, Rainbow Lorikeets were recorded at Marion Way in two weeks of September 1999 and during two four-week periods (February – mid-March, August – early September) of 2000.

Purple-crowned Lorikeet *Glossopsitta porphyrocephala*

Flocks of Purple-crowned Lorikeets were occasionally recorded flying over Gooseberry Hill. There are records for all months of the year except May and June. They were most numerous in October and November 1992 and in September and October 1995, when they fed on flowering eucalypts (Flooded Gums and exotics) at the Lab. The 1992 occurrences coincided with those recorded by Mawson and Massam (1995) at their site at Forrestfield, about 6 km south-west of Gooseberry Hill.

Australian Ringneck *Barnardius zonarius*

Common along the southern edge of Gooseberry Hill adjacent to suburbia and in the farmland and riverine habitats on the northern side, throughout the year. Few records from the central area of Gooseberry Hill, except from May to October when small numbers nested in the Wandooos there. Serventy's comment "unusual at The Knoll" suggests that numbers may have increased in suburbia since the 1970s.

Australian Ringnecks were observed feeding on Marri seeds and flowers, *Petrophile biloba* seeds, Balga flowers and seeds, wild oats, *Avena* sp. seeds, *Helichrysum lindleyi* flowers, *Watsonia* sp. flowers, scale insects and green seeds on *Eucalyptus nudis* and White Cedar *Melia azedarach* berries at the Lab.

Western Rosella *Platycercus icterotis*

Only 40 records of Western Rosellas were made on Gooseberry Hill in 15 years. They were seen most often in November (7), least often in April (0); and none have been seen on Gooseberry Hill since 1993. At least one pair was resident at the Lab; a flock of 13 was sighted there in May 1987. In 1997, a

pair nested in a hole under the eaves of an old cottage at the Lab. Seen feeding on *Hakea trifurcata* seeds in May and February and on *Watsonia* flowers in October.

Red-capped Parrot *Purpureicephalus spurius*

Present throughout the year on Gooseberry Hill and, unlike Australian Ringnecks, distributed throughout the area. Nests found from August onwards; fledglings seen from October to December.

Recorded feeding on Marri seeds and, less frequently, the dry seeds of *Acacia pulchella*, *Petrophile biloba*, *Isopogon dubius*, *Grevillea endlicheriana*, *G. pilulifera*, *Xanthorrhoea preissii*, the green seeds of *Daviesia horrida* and *Erodium* sp. and on the flowers of *Watsonia* sp.

Budgerigar *Melopsittacus undulatus*

A flock of about 20 birds flew up the main gully on 15 November 1984. (See also Aviary Escapes)

Elegant Parrot *Neophema elegans*

There was a regular within-year pattern of occurrence by Elegant Parrots, with marked between-year variation. Most sightings (89%, n = 147) were made from September to January inclusive, with no records for March, April or July. The few observations in May and June were of birds flying over the area. No Elegant Parrots were seen during 1984 but they were regularly observed in the spring and early-summer of the following seven years; i.e. after the major fire in 1985 and minor fires of 1987 and 1988. Fledglings were seen in November 1985, 1986, 1988 and 1989. There have been only nine records since 1993 (none for 1996 or 1998) and no further evidence of nesting on the area. The ready availability of abundant grass seed such as *Stipa macalpinei* produced

after fire, is probably an important factor in determining whether Elegant Parrots will breed on Gooseberry Hill.

Pallid Cuckoo *Cuculus pallidus*

Calling males were recorded from June to November, with most records (71%) in August and September. The duration and timing of their visits varied considerably between years (Figure 8). No adults were seen in December, January or February, and only one record each for April and May, of silent birds. Pallid Cuckoos were usually found in the cleared farmland, along the Helena River and on the northern fringe of Gooseberry Hill (86% of records). Most records on Gooseberry Hill proper were made during 1986 - 1987, a time when the recently burnt habitat probably provided feeding rather than breeding opportunities.

The only evidence of breeding was at the Lab, where a newly fledged cuckoo was fed by New Holland Honeyeaters on 26 October 1988 and an older fledgling was seen every day from 1 December 1997 to 24 December 1997, feeding on a White Cedar *Melia azedarach* heavily infested with caterpillars, which were probably the larvae of the Cedar Moth

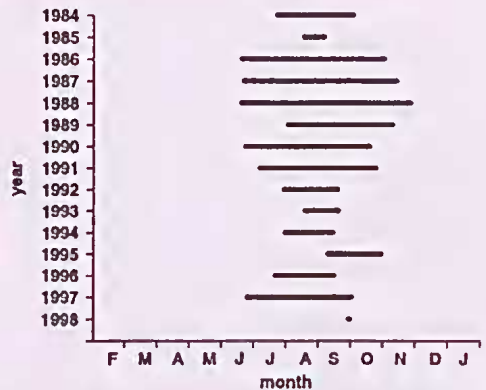


Figure 8. Length of stay of Pallid Cuckoos at Gooseberry Hill, 1984-1998.

Leptocneria reducta. Ian Rowley (pers. comm.) recorded a fledgling at Guildford on 23 December 1994.

A fledgling was fed by White-breasted Robins *Eopsaltria georgiana* along the Helena River in November 1999.

Fan-tailed Cuckoo *Cacomantis flabelliformis*

Fan-tailed Cuckoos were regular breeding migrants to Gooseberry Hill. Their time of arrival (earliest call) varied from 1 May in 1990 to 4 July in 1994 (median 3 June, $n = 15$) (Figure 9). Last calls of the season varied from 7 September in 1996 to 2 November in 1998 (median 17 October, $n = 15$). Juveniles were present on the area until 1 February.

Calling in the riverine habitat was heard more often in May to mid-June and October, than in the intervening months. Three calls were recognized - the "trill", the mournful rising "whistle" and the "chirree" (Marchant & Hohn 1980; Brooker & Brooker 1994b). The "trill" was the call heard most often (88%), followed by the "whistle" (8%) and the "chirree" (4%) ($n = 395$).

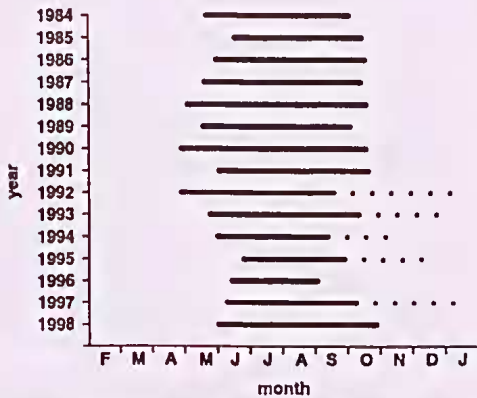


Figure 9. Length of stay of Fan-tailed Cuckoos at Gooseberry Hill, 1984-1998 (dots on right indicate juveniles).

There were no obvious differences between months in the frequencies of the three calls.

Parasitism was recorded in 12 White-browed Scrubwren nests (cuckoo eggs estimated to have been laid September 1985, August and October 1986, July and August 1987, July and August 1988) and three Inland Thornbills nests (cuckoo eggs estimated laid July and August 1987).

In one Inland Thornbill nest (8702), the cuckoo egg was laid before the clutch was complete; the incubation period was 15 d measured from the time of laying and 13 d from clutch completion (i.e. presumed start of incubation); the cuckoo chick had ejected two unhatched thornbill eggs before it was 23 - 40 h old; the nestling period was 18 - 19 d. Growth curves for body mass and folded wing length of one nestling are shown in Figure 10.

Horsfield's Bronze-Cuckoo *Chrysococcyx basalis*

Horsfield's Bronze-Cuckoo was a common breeding migrant to Gooseberry Hill in the 1980s, but has been rare to absent in the 7 years since 1991, a period when the major host in this area (Splendid Fairy-Wren) was in considerable decline. Arrival and



Figure 10. Body mass and folded wing length of a nestling Fan-tailed Cuckoo ($n = 1$).

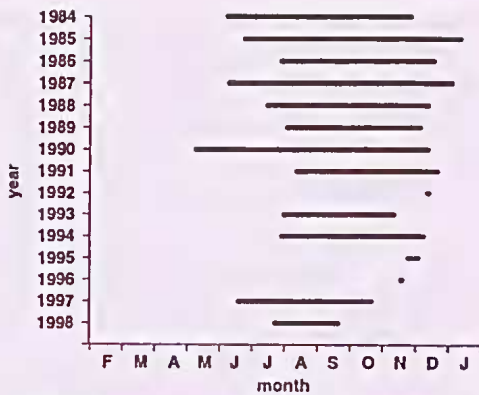


Figure 11. Length of stay of Horsfield's Bronze-Cuckoos at Gooseberry Hill, 1984-1998.

departure dates (observations based on call) are shown in Figure 11.

Three types of call (Brooker & Brooker 1994b; Higgins 1999) were recorded, the descending "phew", the "churr" and a rare sparrowlike "chirrup" (called "strill" by Dell 1971).

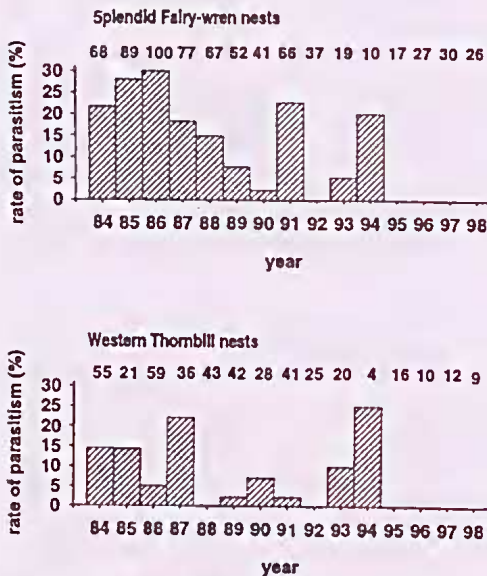


Figure 12. Rates of parasitism by Horsfield's Bronze-Cuckoos of Splendid Fairy-wrens and Western Thornbills, 1984-1998 (total nests across top).

Horsfield's Bronze-Cuckoos parasitized Splendid Fairy-wrens, Western Thornbills and Scarlet Robins on Gooseberry Hill (Brooker & Brooker 1986, 1988, 1989a, b, 1992). The proportions of nests parasitized since 1984 are shown in Figure 12. The incubation period of the cuckoo egg varied: 12 d in Splendid Fairy-wren nests ($n = 10$); > 13 d in a Western Thornbill nest ($n = 1$). The cuckoo chick had usually ejected any host eggs or young before it was 48 h old. Nestling period in nests of Splendid Fairy-wrens was 16 - 17 d ($n = 10$) and in nests of Western Thornbills 20 d ($n = 1$). A growth curve for nestling Horsfield's Bronze-Cuckoos is given by Brooker & Brooker (1989).

Although a number of adults and nestlings were colour-banded (Table 3), none were resighted in subsequent years. However it is possible that banded birds may have been missed as their feathered tarsi and tendency to present a silhouette when perched, made it difficult to check whether or not a bird was banded.

Shining Bronze-Cuckoo *Chrysococcyx lucidus*

A regular breeding migrant to

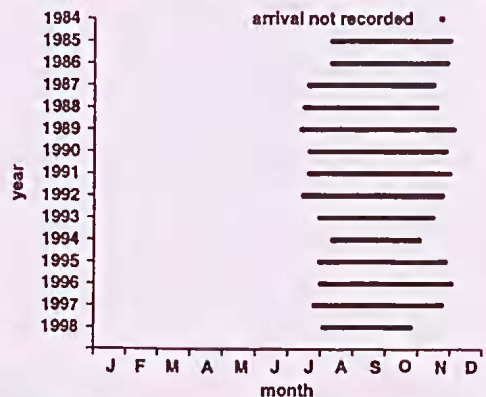


Figure 13. Length of stay of Shining Bronze-Cuckoos at Gooseberry Hill, 1984-1998.

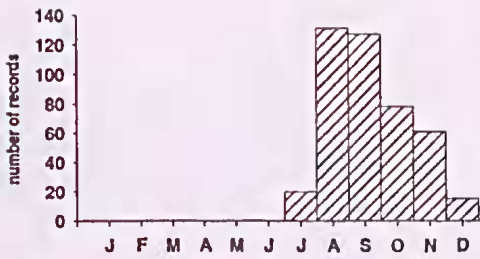


Figure 14. Frequency of calling Shining Bronze-Cuckoos at Gooseberry Hill, 1985-1998.

Gooseberry Hill from mid-July to early December (Figure 13). The median date of arrival (from observations based on call) was 4 August ($n = 14$); departure 28 November ($n = 15$). Equivalent dates for Woorooloo (25 km north-east of Gooseberry Hill) were 16 August (arrival) and 24 November (departure) (Sedgwick 1956). On Gooseberry Hill, juveniles were recorded until early January. Shining Bronze-Cuckoos called

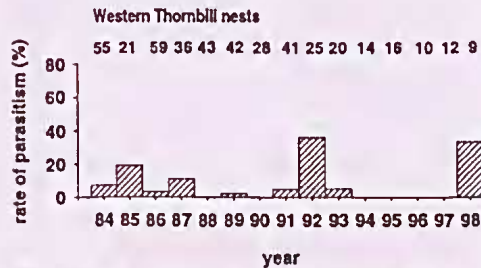
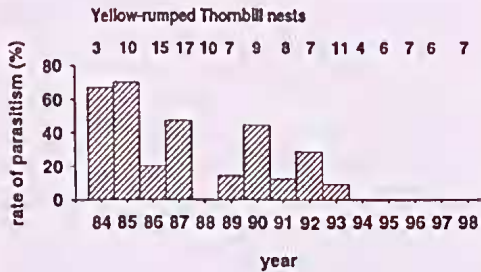


Figure 15. Rates of parasitism of Yellow-rumped Thornbills and Western Thornbills by Shining Bronze-Cuckoos at Gooseberry Hill, 1984-1998 (total nests across top).

most frequently in August and September (Figure 14).

Both Yellow-rumped and Western Thornbills were parasitized throughout Gooseberry Hill (Brooker & Brooker 1986, 1988, 1989a,b, 1992), the former also in cleared areas such as Farrant's Paddock (Figure 15). Two nests of Inland Thornbills in Farrant's Paddock also were parasitized.

The incubation period of the cuckoo egg was 14 - 15 d in Yellow-rumped Thornbill nests ($n = 4$). The cuckoo chick had usually ejected any host eggs or young before it was 96 h old, sometimes before 48 h. Nestling period in nests of Yellow-rumped Thornbills was 18 - 23 d ($n = 4$) and in nests of Western Thornbills 22 d ($n = 1$). A growth curve for nestling Shining Bronze-Cuckoos is given by Brooker & Brooker (1989).

Southern Boobook *Ninox novaeseelandiae*

Single birds and pairs seen occasionally on Gooseberry Hill (15 records) in all months except January and April. At Marion Way some were present throughout the year (Figure 16). Most of these records (91%) were based on call. All sightings were of birds roosting in the garden in summer when fledglings were present. Fledglings appeared at



Figure 16. Number of weeks in which Southern Boobooks were recorded at Marion Way, 1984-1998.

Marion Way from late December to early January in 1985, 1986, 1987, 1990, 1993 and 1995, which indicates that breeding was successful in 6 of 15 years (40%).

Barn Owl *Tyto alba*

Heard occasionally at Lab (Nov 1985, Feb 1995) and at Marion Way (Dec 1984, Jan 1985, Feb 1985, Nov 1985). Three small nestlings were found when a large dead Marri fell in Clayton Road, Helena Valley on 18 June 1996.

Tawny Frogmouth *Podargus strigoides*

Present in all months of the year on Gooseberry Hill and at Marion Way (Figure 17). Unlike Southern Boobooks, most of the records for Marion Way (85%) were based on sightings rather than call. No calling was recorded from May to mid-August. Tawny Frogmouths have a long breeding season, from 29 August (earliest, sitting on eggs) to 21 February (latest, 2 young fledged). The latter were seen with their parents until 19 April 1998. The combined length of incubation and nestling periods was 57 days, which is within the range (54-60 days) given by Körtner and Geiser (1999).

Another nest in the same area was built by 15 August; the female commenced sitting on 29 August; one chick fledged on 24 October and the second on 26 October 1998; both were still present on 21 November. The family of four were again perched in the nest tree on 24 March 1999. A 2 m high nest site in a Wandoo tree was used in 1988 and 1990. One individual was fitted with a metal band on its right leg on 23 March 1987. A bird of this description was re-sighted in the same area on 3 February 1991 and again, with a fledgling, on 22 November 1991. Although the band number was not verified, it is highly



Figure 17. Number of weeks in which Tawny Frogmouths were recorded on Gooseberry Hill, 1984-1998.

likely that these sightings refer to the same individual.

Spotted Nightjar *Eurostopodus argus*

A Spotted Nightjar was found dead on the Zig Zag Road on 5 April 1991. Another rose from the ground in a gully on Gooseberry Hill on 10 April 1995. Serventy flushed a bird near the Zig Zag Road on 2 June 1962.

These observations are consistent with the status category "casual", given by Johnstone and Storr (1999) for the Darling Range.

Australian Owlet-nightjar *Aegotheles cristatus*

Between November 1984 and June 1988 Australian Owlet-nightjars were heard on 15 occasions, all on the southern half of Gooseberry Hill, mostly from October to February (11 of 15 records). One bird was observed at the entrance to a hollow in a Wandoo tree on 12 December 1984 and one dark grey individual was found dead on the Zig Zag Road on 11 November 1987. Since 1988 there have been no further records.

Fork-tailed Swift *Apus pacificus*

Two flocks, each of about 20 birds, were recorded on 1 April 1990 and 2 March 1996. These were times when Fork-tailed Swifts were recorded elsewhere in

the Perth area (WA Bird Notes 53, 54 and 78).

Laughing Kookaburra *Dacelo novaeguinae*

Common along the northern and southern fringes of Gooseberry Hill (64% of records) but seen occasionally throughout the area in all months.

The earliest fledglings were recorded on 8 October; latest on 11 February (n = 11). A fledgling banded in February 1992 was found 33 months later, drowned in a pool 1.2 km from the banding site. A juvenile banded in February 1995 was rescued 69 months later from a swimming pool about 400 m from the banding site. An adult banded in December 1984 was resighted on several occasions at the banding site; the last occasion 70 months after banding.

I mist-netted an adult at a Kalamunda residence on 21 December 1988. It had become a nuisance by constantly striking a large window and there was a danger that the two large dogs inside the house would smash the glass as they tried to attack the kookaburra. I transported the bird to Wundowie and released it. However, six weeks later it had returned, covering a straight line distance of 30 km. Although not banded, I could be certain that it was the same bird because it attacked the window in the same fashion, had the same deformed lower bill and was very wary of mist-nets. It subsequently disappeared.

Sacred Kingfisher *Todiramphus sanctus*

Sacred Kingfishers were regular breeding migrants to Gooseberry Hill. Arrivals and departures from 1984 to 1998 are shown in Figure 18. The median date of arrival was 20 September (n = 14),

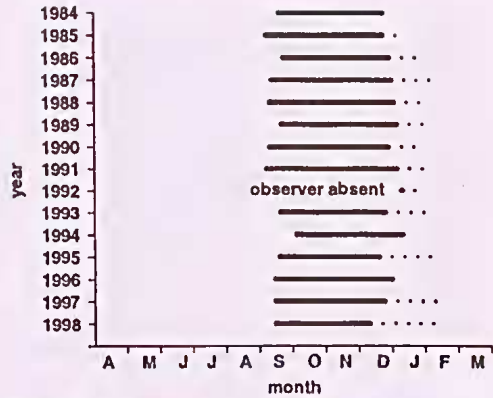


Figure 18. Length of stay of adult Sacred Kingfishers at Gooseberry Hill, 1984-1998 (dotted lines indicate presence of juveniles).

somewhat earlier than that reported for Woorooloo (12 October, n = 3) by Sedgwick (1956). The median departure date for adults was 5 January (n = 15). The first sightings of Sacred Kingfishers each year were always in or near the Helena River. Most adults had usually departed by mid-January; adults at late nests appeared to leave their young soon after they had fledged. Juveniles were present until mid-February, often congregating around swimming pools and dams before departure. An estimated 5 to 6 pairs nested on Gooseberry Hill (114 ha) with a further 2 to 3 pairs in the adjoining riverine habitat.

Nests were found in Marri and Wandoo trees. At least two regularly-used nesting trees were burnt down during the study.

One adult colour-banded on 20 October 1984 was resighted in the same area on 17 October 1985. A dead juvenile was found with its legs entwined in dodder *Cassytha racemosa* on 11 February 1987 (Brooker 1987).

Rainbow Bee-eater *Merops ornatus*

The clockwork regularity of arrival and departure by Rainbow Bee-eaters at

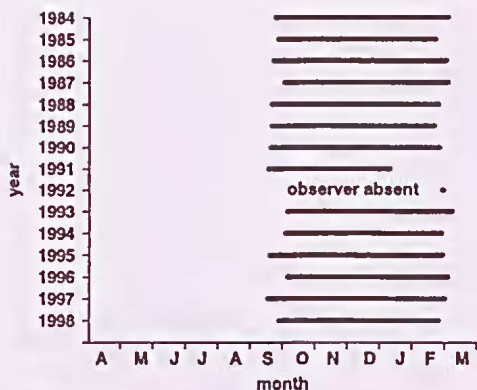


Figure 19. Length of stay of Rainbow Bee-eaters at Gooseberry Hill, 1984-1998.

Gooseberry Hill is shown in Figure 19. The median date of arrival was 28 September ($n = 14$), about 2 weeks earlier than for Woorooloo (Sedgwick 1956), whereas the median dates of last sightings were similar - 9 March for Gooseberry Hill ($n = 15$) versus 12 March at Woorooloo ($n = 3$). Birds always arrived in late September to early October and the last birds were usually seen in mid-March. They nested in the sandy level parts of Gooseberry Hill in the years after fire in the 1980s but not after the 1994 fire. In most years, nests were found at the Lab. Observations at 11 nests suggest that excavations began in mid-October. Fledglings were observed in mid-January (1 record).

Rufous Treecreeper *Climacteris rufa*

One bird was seen feeding on the ground on 12 February 1986.

Splendid Fairy-wren *Malurus splendens*

Splendid Fairy-wrens were found in all habitats on Gooseberry Hill. Over a 26 year period (1973 - 1998), densities fluctuated from 20 to 105 adults per 100 ha (Figure 20), with fire having a major, though indirect, effect (Rowley &



Figure 20. Densities (adults per 100 ha) of Splendid Fairy-wrens on Gooseberry Hill, 1973-1998.

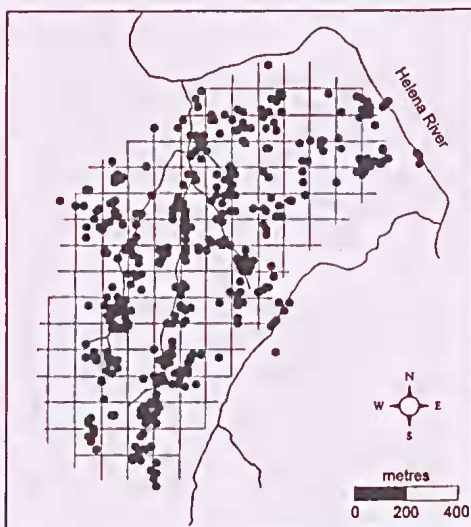


Figure 21. Locations of Splendid Fairy-wren nests (1983-1998) on Gooseberry Hill were mainly in the thicker vegetation along gullies.

Brooker 1987, Brooker & Rowley 1991, Brooker 1998).

The locations of 443 nests are shown in Figure 21. The nesting substrates used were the most varied of all the species examined (Appendix 3); choice of substrate varied depending on time since fire (Brooker & Rowley 1991). The percentage of nests in *Acacia pulchella* was low in 1992 - 1993, when most bushes were dead (6 - 7 years

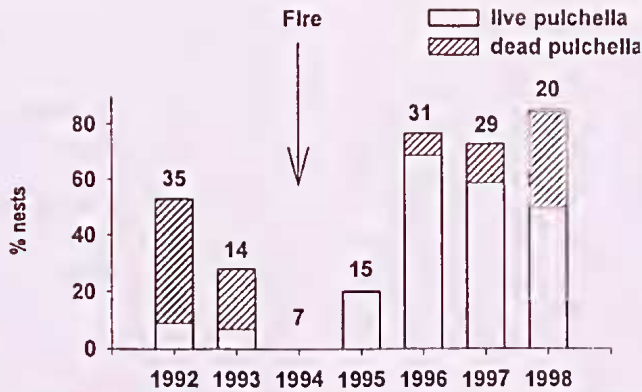


Figure 22. The percentage of Splendid Fairy-wren nests built in live and dead *Acacia pulchella*, 1992-1998 (numbers above show total number of nests found).

unburnt). After the 1994 fire, the wren's choice of *A. pulchella* tracked the life cycle of this obligate seeder, as it regenerated, became abundant and subsequently died (Figure 22).

The breeding biology of the Splendid Fairy-wren is given in detail by Rowley et al (1991). Eggs were laid from late-August to January, mainly September - November. Clutch size was three, mean 2.90; incubation period 14 - 15 d; nestling period 10 - 12 d. From 1973 to 1989, 20% of all Splendid Fairy-wren nests (n = 764) were parasitized by Horsfield's Bronze-Cuckoos, none by Shining Bronze-Cuckoos (Brooker & Brooker 1992).

The results of Ian Rowley's studies of Splendid Fairy-wrens on Gooseberry Hill have made major contributions to the fields of behavioural ecology, cooperative breeding systems, brood parasitism, mating systems and the effects of fire on avifauna (see Bibliography).

Red-winged Fairy-wren *Malurus elegans*

Until January 1987, Red-winged Fairy-wrens were recorded only in the riverine

habitat along the Helena River where there is a resident population. However, between 1991 and 1993 they were recorded in some parts of Gooseberry Hill and almost certainly nested there. In the two years after the 1994 fire they were recorded only once, but 3-4 groups bred during the following three years, whereas only one group nested in the two years after that, suggesting that in this area they prefer habitat burnt 3-5 years previously. Red-winged Fairy-wrens are commonly found in the wetter gullies on other sections of the Darling Scarp, so it may be that their absence from the gullies on Gooseberry Hill during the early 1980s may have been due to the fire frequency (Brooker 1998).

On two occasions, Red-winged Fairy-wrens nests were found within 50 m of occupied Splendid Fairy-wren nests and, on another occasion, a mixed flock of Splendid and Red-winged fledglings was observed. On 8 October 1998, a male Red-winged Fairy-wren was seen stealing food from a female Splendid Fairy-wren en route to her nest.

Eggs were laid from early September to late November; fledglings seen from early October to late December.

Southern Emu-wren *Stipiturus malachurus*

Emu-wrens were not recorded on Gooseberry Hill, although they have been found about 5 km south on the Darling Scarp, in apparently similar vegetation which is also frequently burnt. One possible explanation for this could be that the escarpment in that area more closely abuts the coastal plain, which might provide a more suitable habitat.

Spotted Pardalote *Pardalotus punctatus*

Spotted Pardalotes were seen occasionally on Gooseberry Hill, mainly in August with few records for December or January and none for February. At Marion Way most records were in June and July. There were few or no records in some years e.g. 1991, 1993, 1995 and 1997 and Serventy recorded Spotted Pardalotes at The Knoll in only 10 of 18 years observation (1957-1974). According to Serventy and Whittell (1976) there may be considerable variation in the numbers reaching Perth from the South-West each autumn.

In this study, they were observed most often in *Eucalyptus rudis* habitat along

the Helena River, where they nested in the river bank in 1984 and 1985.

Striated Pardalote *Pardalotus striatus*

Numerous throughout Gooseberry Hill from August to January. In other months, particularly mid-April to July (Figure 23), abundances varied from year to year. Low recording rates in the three years 1985, 1987 and 1994 could have been due to wildfires on Gooseberry Hill the previous summer, although other low years such as 1984 and 1992 could not have been due to fire, nor were the Marion Way figures related to fire. Serventy also noted that they were "absent or almost absent between April and September in some years". Wykes (1985) found that Striated Pardalotes were absent from a Jarrah forest site south-east of Perth during winter 1981, but present throughout 1982. He suggested that changes in density were related to arthropod abundances rather than climatic factors (see also Sedgwick 1971).

Striated Pardalotes nested in live Marri trees and dead and live Wandooos. Building commenced in August; nests with young were recorded from October to December, occasionally as late as January.

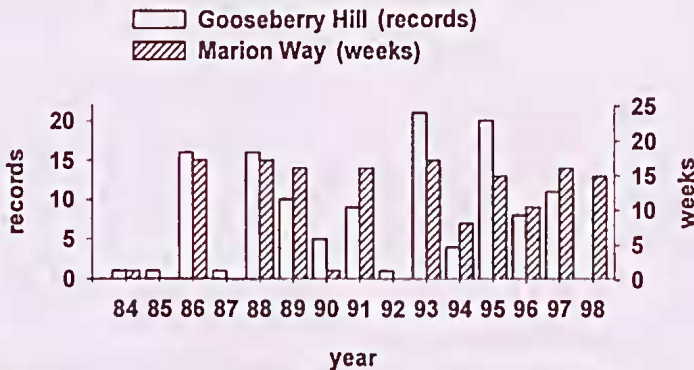


Figure 23. Mid-April to July records of Striated Pardalotes on Gooseberry Hill (solid) and at Marion Way (hatched), 1984-1998.

White-browed Scrubwren *Sericornis frontalis*

A common resident in all heathland habitats that have remained unburnt for at least four years. Uncommon in the years following the major fires of 1985 and 1994, when they were confined to gullies. Movements of two colour-banded males illustrate the scrubwren's intolerance of fire-affected habitat. After the 1987 fire, male #974 left his home territory where he had bred the previous season and moved 1 km to an unburnt area (Figure 24) where he bred successfully for two subsequent seasons. Male 933, who had been a neighbour of #974 in 1986, vacated the burnt area for two years and then returned and bred in his previous territory, now with 3 years post-fire growth.

The average home range of 9 adults during the breeding season was 0.52 ha (Calhorne 90% contour, Kie et al. 1994). Dispersal data for 5 individuals

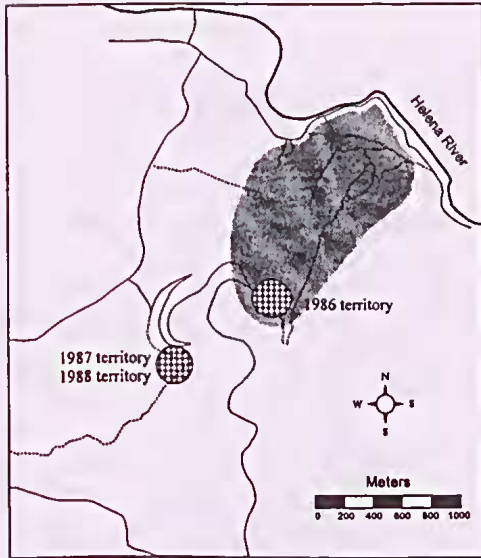


Figure 24. Relative locations of territories (hatched) held by colour-banded male White-browed Scrubwren 974, whose 1986 territory was burnt in February 1987.

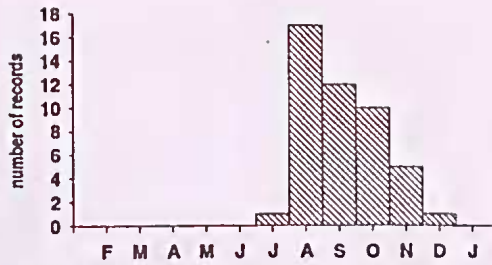


Figure 25. Number of records of White-browed Scrubwrens with fledglings.

banded as nestlings shows that some young were highly dispersive in their first year, with 4 of the 5 moving outside their natal area as early as 2 months post-fledging.

White-browed Scrubwrens nested from July (earliest fledgling 28 July) to November (latest fledgling 1 December) (Figure 25), with most breeding records from August to October. There was no breeding recorded in the 1985 and 1986 seasons following fire and only two records in 1988. One of these nests was built under a pile of dead Marri leaves accumulated from leaf-fall after the fire. Of 41 groups whose chicks or fledglings were seen, six (14.6%) were parasitized by Fan-tailed Cuckoos.

Weebill *Smicromis brevirostris*

Weebills were permanently sedentary on Gooseberry Hill where they showed a strong preference for areas with Wandoo trees (Figure 26) and a dislike for those with pure Marri. In some sections with good stands of Marri but no Wandoo, Weebills were never recorded in 15 years. However, there were only two records from a relatively dense stand of Wandoo on the south-east side of the area (Figure 26), perhaps because of its isolation from other patches of Wandoo. Weebills were uncommon at Marion Way, where the Marri is the dominant tree (Marri 60 vrs Wandoo 4), being

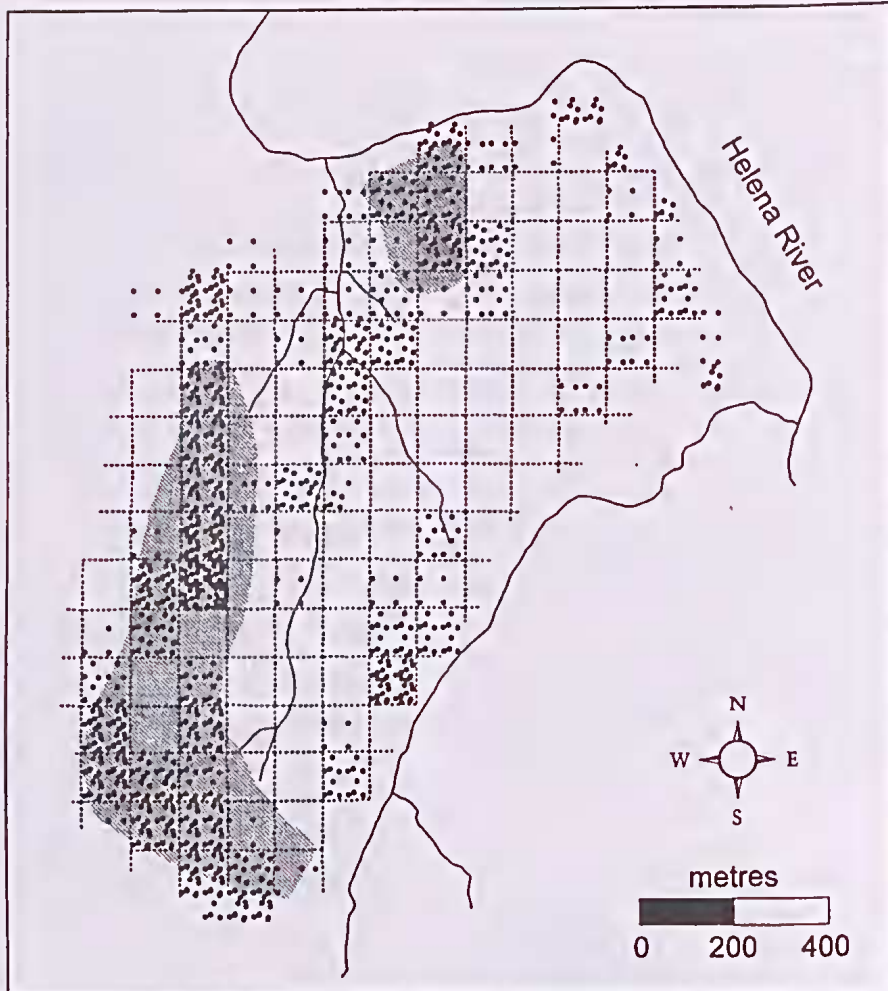


Figure 26. Areas where Weebills were common (shaded), compared to areas where Wandooos were common (stippled) on Gooseberry Hill.

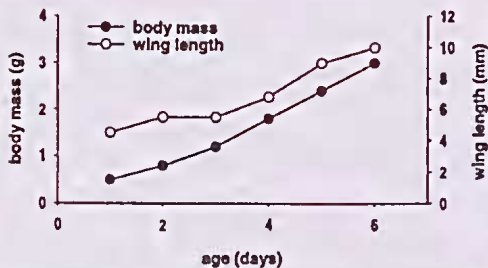


Figure 27. Body mass and wing length of one known-age nestling Weebill.

recorded in only 127 of 780 weeks (16.3%), usually outside their breeding season and not at all in 4 of the years. Weebills were also recorded in Flooded Gums along the Helena River.

Nest building was recorded from 21 July (earliest) to 12 January (latest); earliest eggs 15 August. Both sexes build the nest. All nests found ($n = 12$) were in Wandoo trees or Marris; height from ground to base of nest 1.5 - 12.0 m. Body mass and wing length of a known-age nestling are shown in Figure 27.

Western Gerygone *Gerygone fusca*

Found in all habitats on Gooseberry Hill in all months of the year. Although there were few records in the three months following a major fire (3 records after the January 1985 fire, none after the 1994 fire), some breeding activity was observed in the spring of these years.

Few nests were found, but the number of fledglings gives a good indication of breeding as fledglings of this species are readily detected by call. Although nest building was observed as early as late-August, most fledglings were recorded from November to January (Figure 28). At one nest where both adults were colour-banded, only the female did the building.

In Jarrah forest south-east of Perth, Wykes (1985) found a summer peak in the abundance of active, foliage-dwelling insects. He suggested that this was related to a preference for summer breeding by Weebills.

Observations of five adults colour-banded at Marion Way (Table 4) indicate that Western Gerygones are resident breeders there.

Inland Thornbill *Acanthiza apicalis*

Recorded along the Helena River and on the southern edge of the Gooseberry Hill area, less frequently elsewhere. The numbers of Inland Thornbills were

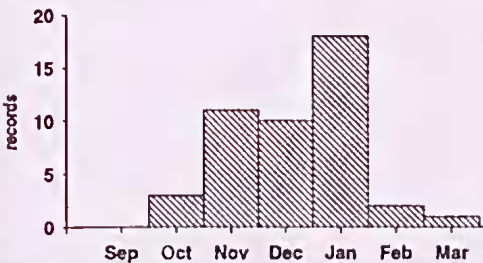


Figure 28. Number of records of fledgling Western Gerygones.

Table 4. Observation histories of five colour-banded Western Gerygones at Marion Way.

band	date	observation
XRY	28 July 1984	banded
	6 April 1985	present
	2 November 1985	with fledgling & YBX
YBX	25 November 1984	banded
	2 November 1985	with fledgling & XRY
	10 April 1986	present
	27 January 1987	with fledgling
XGY	21 November 1987	banded
	31 December 1987	at nest
	10 March 1988	present
	3 April 1988	present
	30 January 1989	present
	4 February 1989	with fledgling
RX	28 December 1993	banded
	9 January 1995	with fledgling
	30 August 1996	present
	1 January 1997	with fledgling
	28 June 1997	present
BX	22 July 1998	banded
	10 February 1999	with fledgling

lowest in the three years following the January 1985 fire and more especially in the five years following the 1994 fire when only three records were made.

Nests were found only in vegetation that had remained unburnt for at least 4 years. Eggs were laid from 14 August (earliest) to 13 October (latest) (n = 11). Ten nests were built in shrubs (mean height 1.0 m, range 0.7 - 1.4 m) and one in a Marri tree at 4.5 m (Appendix 3). Three nests fledged a Fan-tailed Cuckoo and two contained an egg of the Shining Bronze-Cuckoo, one of which fledged.

One male, banded in August 1984, was seen again on Gooseberry Hill until

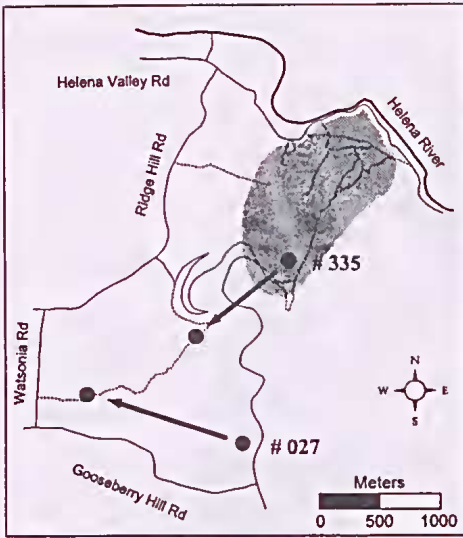


Figure 29. Movements by two Inland Thornbills.

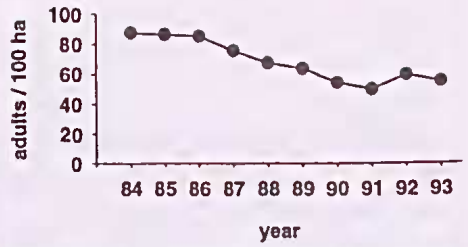


Figure 30. Adult densities of Western Thornbills on Gooseberry Hill, 1984-1993.

April 1985, two months after the 1985 fire. He then disappeared from the area and was found nesting in unburnt habitat 1 km away the following spring (#335, Figure 29). Another bird (#027), netted at Marion Way in December 1993 was seen there again in July 1995, then once again three days later in heathland 1.2 km away.

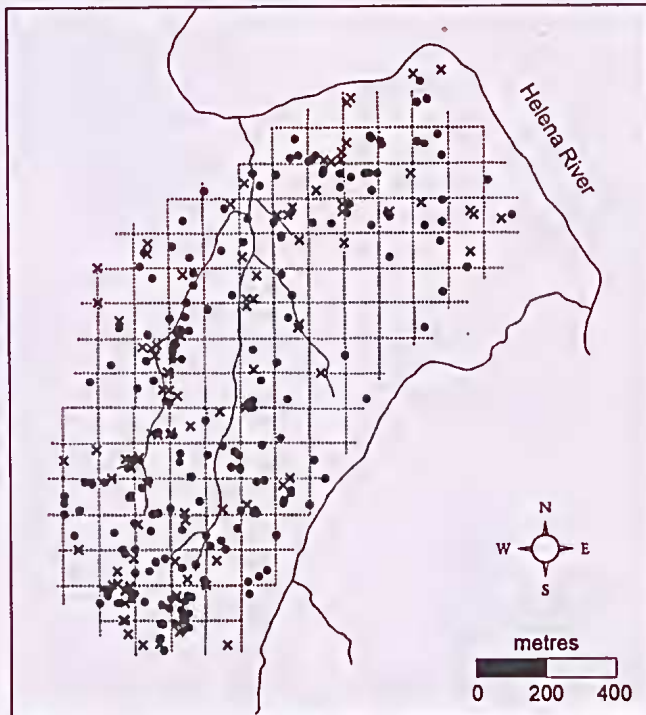


Figure 31. Locations of 315 nests of Western Thornbills 1983-1998; in Balgas *Xanthorrhoea preissii* (dots) and other plants (crosses).

Western Thornbill *Acanthiza inornata*
 Western Thornbills were common resident breeders on Gooseberry Hill. They were less common in riverine habitats and rare at the Lab and Marion Way. Densities on Gooseberry Hill from 1984 to 1993 (Figure 30) showed a decline in the eight years following the major fire in 1985, falling from 86.4 birds per 100 ha in 1985 to 49.7 in 1991. A detailed account of the effects of fire on Western Thornbills is given by Brooker & Rowley (1991) and Brooker (1998).

Western Thornbills bred throughout Gooseberry Hill (Figure 31) in all habitats. Sixty-three percent of nests were in Balgas *Xanthorrhoea preissii* (Appendix 3); with a further 25% in knotholes, spouts, crevices and under the bark of Marris, Wandoo and other trees.



Figure 32. Lay dates of 355 clutches of Western Thornbill eggs.

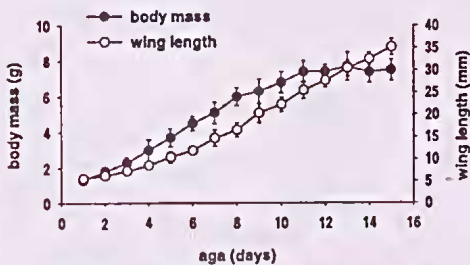


Figure 33. Body mass and wing length for known-age nestling Western Thornbills (n = 11-31).

Eggs were laid from mid-July to mid-December; median second week of September (n = 355) (Figure 32). Clutch size was usually three; incubation period 18 - 19 d; nestling period 17 - 19 d.

From 1984 to 1991, 13% of nests (n = 325) were parasitized by cuckoos; 8% by Horsfield's Bronze-Cuckoos and 5% by Shining Bronze-Cuckoos (Brooker & Brooker 1992). Growth curves for nestling Western Thornbills are shown in Figure 33.

Yellow-rumped Thornbill *Acanthiza chrysorrhoa*

The Yellow-rumped Thornbill is a resident breeder on Gooseberry Hill, found in most habitats across the area, but most frequently in open country. Estimated densities from 1985 to 1998 are shown in Figure 34. An estimate of density for 1984, based on sightings and the number of nests found, suggests that there were no more than six groups at that time, so that the increase in numbers from 1985 to 1987 must have been due to immigration into the area. The more open habitat created by the 1985 and 1987 fires may have promoted this. However, no similar increase followed the 1994 fire.

In 1987 and 1988 there were seven groups nesting in the grounds of the

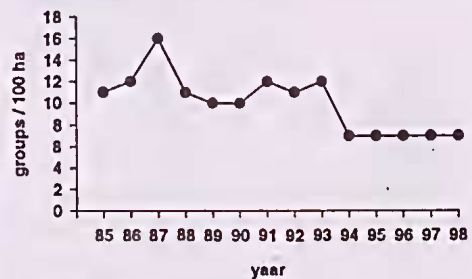


Figure 34. Densities of Yellow-rumped Thornbills on Gooseberry Hill 1985-1998.

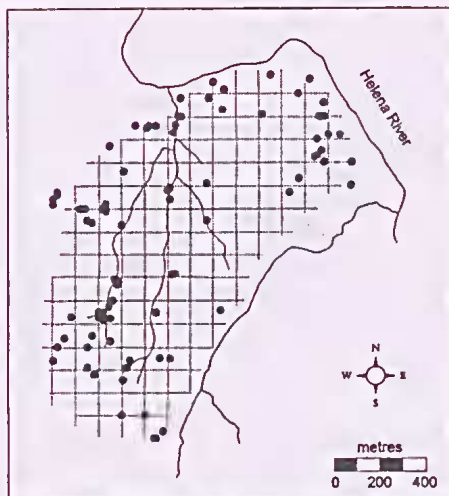


Figure 35. Locations of 137 Yellow-rumped Thornbill nests on Gooseberry Hill, 1984-1998.

Lab. From that time onward, numbers at the Lab appeared to decrease in line with the densities on Gooseberry Hill. Yellow-rumped Thornbills nested regularly in the Picnic Area and in Farrant's Paddocks (up to the time of

redevelopment) but were rarely sighted at Marion Way.

Yellow-rumped Thornbills nested throughout Gooseberry Hill (Figure 35), preferring the more open habitats. Most nests were in trees (Appendix 3), although *Balgas Xanthorrhoea preissii* were also used, especially at the Picnic Area. Unlike Western Thornbills that hide their nests in *Xanthorrhoea* fronds, Yellow-rumped Thornbills attach their nests below the skirt, often precariously. *Hakea lissocarpha* was used only if it had remained unburnt for many years (Brooker & Rowley 1991) (Figure 36).

Eggs were laid from the last week of July to the first week of December, median week 3 of September ($n = 136$). Clutch size was usually three; incubation period 16 - 19 days; nestling period 18 - 21 days. From 1984 to 1991, 32% of nests ($n = 81$) were parasitized by Shining Bronze-Cuckoos (Brooker & Brooker 1992). Growth curves for nestling Yellow-rumped Thornbills are given in Figure 37.

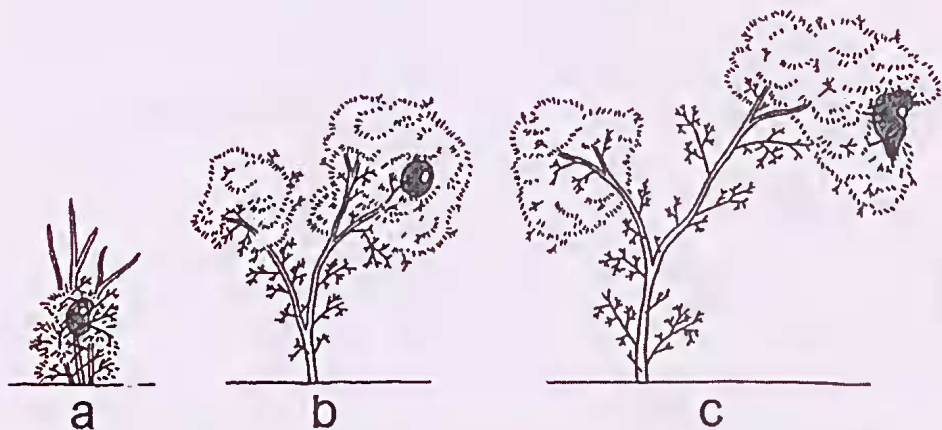


Figure 36. *Hakea lissocarpha* is used by (a) Splendid Fairy-wrens 1-2 years after fire; (b) Western Thornbills 6 or more years after fire; (c) Yellow-rumped Thornbills only if long unburnt

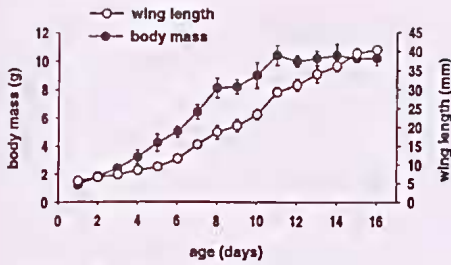


Figure 37. Body mass and wing length of known-age Yellow-rumped Thornbills (n = 2 - 18).

Red Wattlebird *Anthochaera carunculata*

Occupies mainly the northern and southern parts of Gooseberry Hill, where it abuts farmland and suburbia (75% of records). Those birds seen on the central area were usually in transit or foraging on flowering Marri in late summer. Fledglings (n = 33) were observed at the Lab and at Marion Way from July (1 record) to March (3 records) with most from November to January (14). Earliest egg 31 July; latest fledgling 16 March. Three birds for which fledging date was recorded still gave begging calls after 42, 58 and 59 days.

Western Wattlebird *Anthochaera chrysoptera*

Seen in adjoining suburbia, but only rarely on Gooseberry Hill itself, where there were only seven records in 15 years.

Singing Honeyeater *Lichenostomus virescens*

Recorded throughout the year along the Helena River and those parts of Gooseberry Hill adjoining it, but only seven records in 15 years from elsewhere. Singing Honeyeaters may have increased in suburbia here, as Serventy gave no record for The Knoll,

1957-1974. Although at Marion Way there were few records for 1984 - 1990 (recorded on average 3 weeks per year) in the following 8 years they were recorded on 33 weeks per year. They were rarely seen mid-September to mid-November at Marion Way, suggesting that they moved elsewhere to breed.

A nest containing young was found at the Lab on 5 October 1988 and a fledgling was seen on Gooseberry Hill on 13 December 1992.

Yellow-plumed Honeyeater *Lichenostomus ornatus*

Rarely seen on Gooseberry Hill. Observed in June 1985 and June 1990 on flowering Wandoo, and twice during August 1990. Only once seen at Marion Way, in June 1987, on flowering *Dryandra sessilis*. Serventy recorded this species between April and August in 1958, 1959, 1960, 1961 and 1972 at The Knoll, and Mawson and Massam (1995) give one record (March 1992) during three years observations at Forrestfield.

Brown-headed Honeyeater *Melithreptus brevirostris*

Twenty-five records were made on Gooseberry Hill over 15 years, 17 of them during spring (Sept - Nov). One pair (including one banded bird) nested in the same Wandoo tree in the September of 1985 and 1986.

White-naped Honeyeater *Melithreptus lunatus*

Very rare on Gooseberry Hill, with just three records made in 15 years, in May and June. Seen occasionally at the Lab and along Helena River from March to September. No records from October to February. Observations at Marion Way were similar; rare with a peak in numbers in June and July; no records from October to February.

Brown Honeyeater *Lichmera indistincta*

Brown Honeyeaters are present on Gooseberry Hill throughout the year, in all habitats. They tend to be less numerous in summer and early autumn, especially during January and February. In late autumn, their numbers appear to increase until mid July to early August, when they might be described as “noisy and numerous throughout”. Exceptional winters were those of 1985, 1987 and 1994, following major fires. In these years, of the few nests found, none were successful.



Figure 38. Body mass and wing length of known-age nestling Brown Honeyeaters (n = 2-7).

In other years, nesting occurred from August (earliest building) to December (latest nestlings). Of 13 nests with

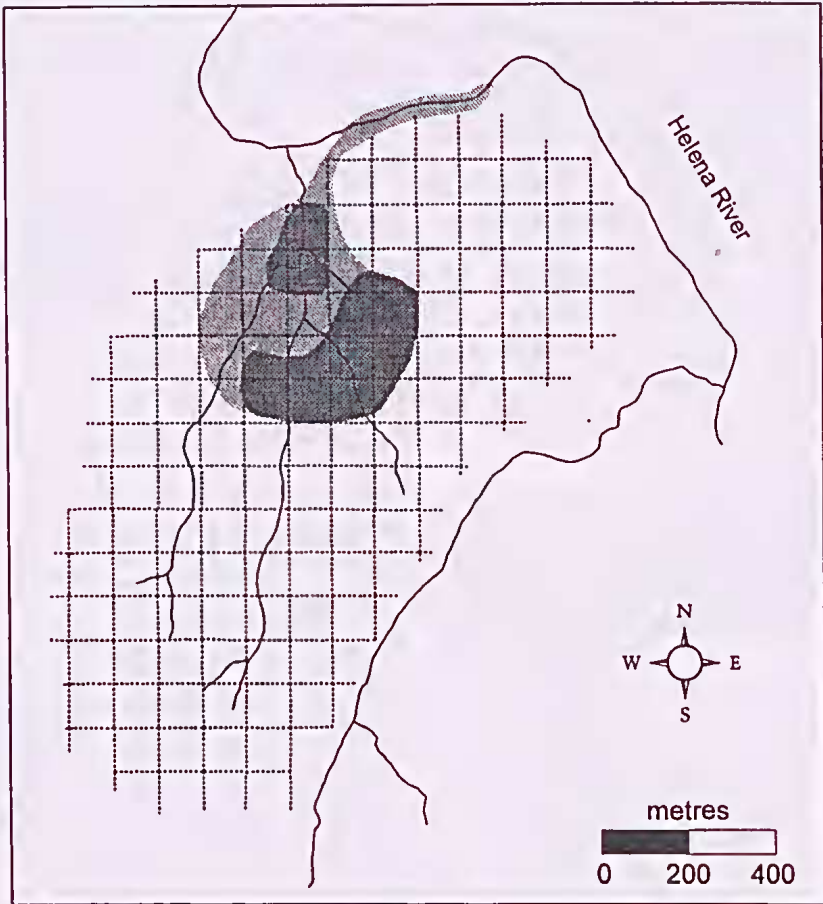


Figure 39. Locations where New Holland Honeyeaters were commonly recorded (darker shading) and infrequently recorded (lighter shading).

detailed observations, 12 contained two eggs or nestlings, and one had three nestlings. At least 22 different trees or shrubs were used as nesting substrates (Appendix 3). Nest height varied: 3 - 5 m in Marris ($n = 2$); 0.9 - 1.6 m in Bargas *Xanthorrhoea preissii* ($n = 4$); 0.3 - 1.1 m in shrubs ($n = 26$); overall median 0.7 m; overall mean $0.76 \text{ m} \pm 0.24$. One nest, that fledged two Brown Honeyeaters on 19 November 1985, was built inside an old Splendid Fairy-wren nest that had been relined with *Macrozamia riedlei* bast. Incubation period 13 - 14 d ($n = 2$); nestling period 15 d ($n = 2$). Growth curves for body mass and folded wing length of nestlings are shown in Figure 38.

A total of 161 adults, 10 juveniles and 39 nestlings were banded. Eight were retrapped at or near their banding site: three males 1, 2 and 69 months after banding; two females after 13 and 17 months; one nestling after 11 months and two unsexed adults after 10 and 12 months.

New Holland Honeyeater *Phylidomyris novaehollandiae*

While numerous at the Lab and along the river, New Holland Honeyeaters were not common on Gooseberry Hill. The majority of records were made from August to October, mainly during the period 1991-1993, when the vegetation had 7 - 9 years of regrowth following the 1985 and 1987 fires. Most records were from the northern edge of Gooseberry Hill, near the river and the lower reaches of the main gully (Figure 39), where breeding was recorded in 1990-1993.

New Holland Honeyeaters were often observed feeding on flowering *Dryandra sessilis*, which regenerates from seed after fire, and less frequently on invertebrates taken from the trunks of



Figure 40. Body mass and wing length of one nestling New Holland Honeyeater.

Marri, sometimes in company with Western Spinebills and Brown Honeyeaters.

Fledglings were seen from July to November. In two nests, incubation period was 14 - 15 d. Eggs were laid at 24 h intervals. Growth curves for one nestling are shown in Figure 40.

White-cheeked Honeyeater *Phylidomyris nigra*

Recorded on Gooseberry Hill in dense vegetation in gullies, but not along the Helena River (Figure 41). Seen mainly from April to December (Figure 42), except in the years following major fire (no records 1985, 1986, 5 in 1987, none in 1994, 1995 or 1996). At Marion Way, most frequently recorded in January and February when mistletoe *Amyema preissii* was flowering and in May and June on *Dryandra sessilis* (Figure 42).

Nests were found in a variety of shrubs (Appendix 3) and Bargas *Xanthorrhoea preissii* from 0.4 to 1.8 m above ground ($n = 6$). Clutch size was 2 in all nests found with eggs (2) and young nestlings (4). Of 14 breeding records, the earliest hatch was 27 June, the latest 11 November; fledglings were seen from August to November. Growth curves for 2 nestlings are given in Figure 43.

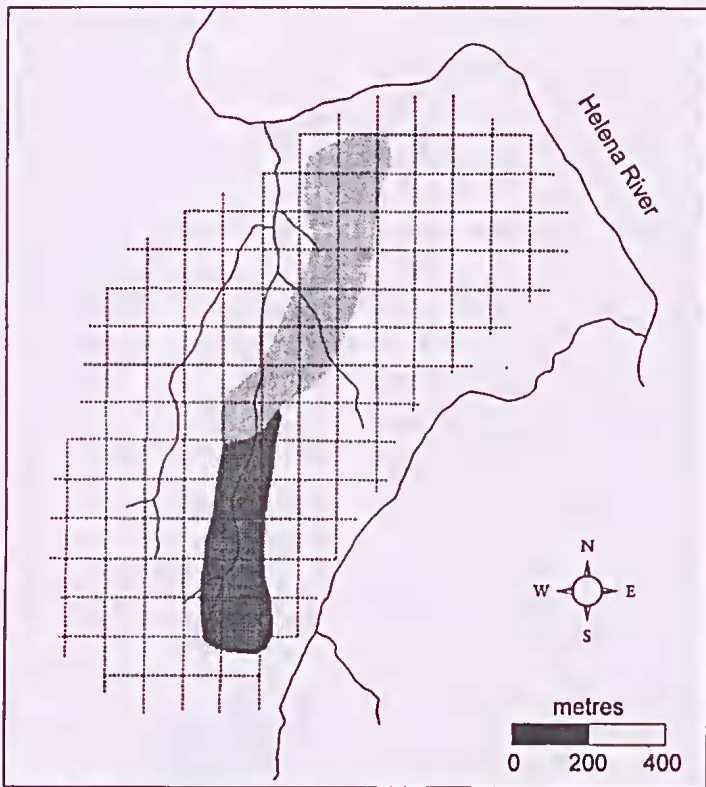


Figure 41. Locations where White-cheeked Honeyeaters were commonly recorded (darker shading) and infrequently recorded (lighter shading) on Gooseberry Hill.

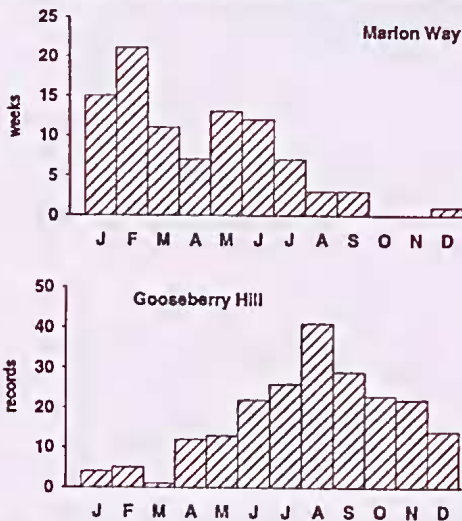


Figure 42. Records of White-cheeked Honeyeaters at Marion Way and Gooseberry Hill, 1984-1998.

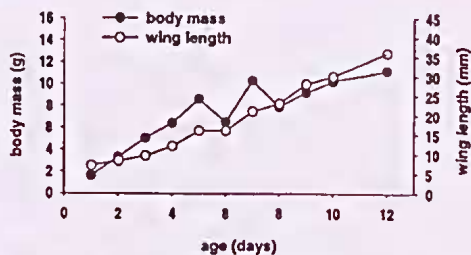


Figure 43. Body mass and wing length for 2 known-age nestling White-cheeked Honeyeaters.

Tawny-crowned Honeyeater *Phylidonyris melanops*

Tawny-crowned Honeyeaters were the second most abundant honeyeater on Gooseberry Hill, after the Brown Honeyeater. Some were present

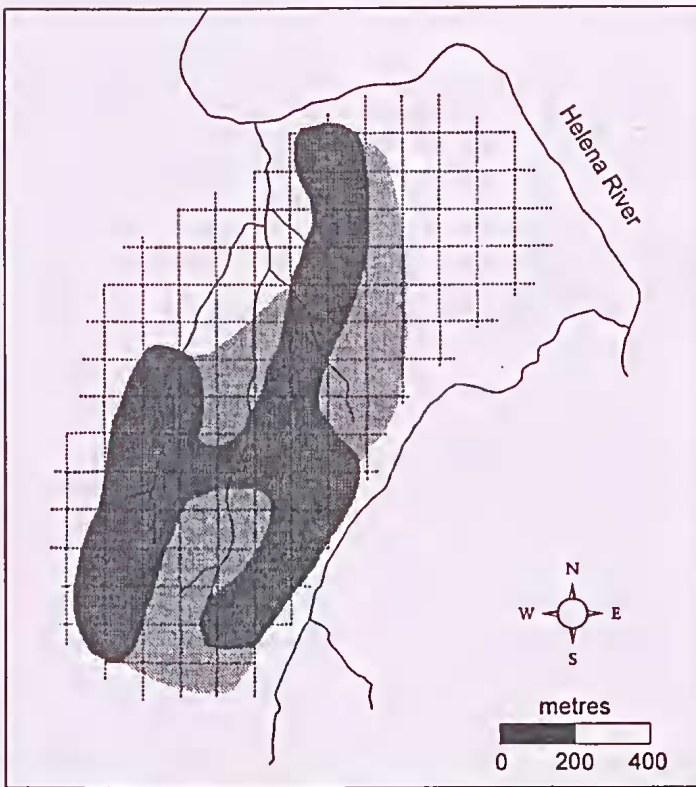


Figure 44. Locations where Tawny-crowned Honeyeaters were commonly (dark shading) and infrequently (light shading) recorded.

throughout the year, usually on the slopes and ridge tops rather than the gullies (Figure 44). They were never recorded in the riverine habitat, at the Lab or at Marion Way and there few records in the six months following the hot summer fires of 1985 and 1994, although they nested in resprouting shrubs the following spring. Numbers were lowest from late summer to early autumn when they appeared confined to areas of flowering *Calothamnus hirsutus*.

Over 60 breeding attempts were recorded over an extended season from July to January (Figure 45). Earliest eggs 28 July; latest eggs 15 December. Of nests found with eggs: C1 (1), C2 (16), C3 (1); of nests found with young: one

chick (4), two chicks (11), three chicks (2). Of 31 nests where the nesting substrate was recorded, 16 were in *Dryandra armata* (Appendix 3). The median height from ground to base of nest was 0.28 m, range 0.10 to 1.0 m ($n = 28$). Growth curves for two nestlings are shown in Figure 46.

A total of 24 adults and 15 nestlings were colour-banded. The small number of subsequent sightings suggests that the population at Gooseberry Hill is mobile. Only two males and two females originally trapped at nests, were ever seen again; the males 13 and 24 months after banding; the females both 11 months later. One young bird banded as a nestling, was seen again near the natal

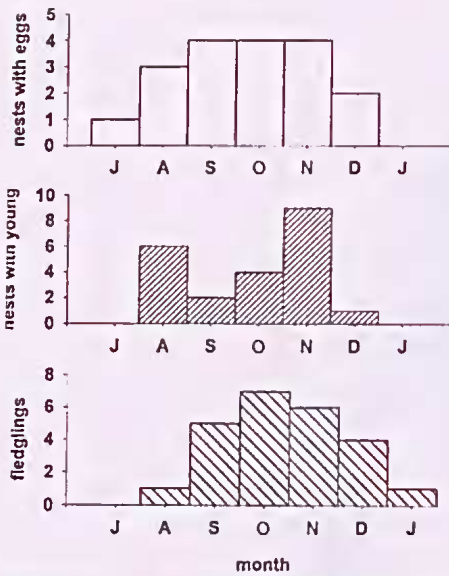


Figure 45. Breeding season of Tawny-crowned Honeyeaters at Gooseberry Hill, 1984-1998.



Figure 46. Body mass and wing length of two known-age nestling Tawny-crowned Honeyeaters.

area after 17 months. None of eight birds netted on flowering *Calothamnus sanguineus* in April were ever resighted.

Western Spinebill *Acanthorhynchus superciliosus*

The occurrence and abundance of Western Spinebills on Gooseberry Hill were erratic, both within and between years. While there were records for all

months of the year (Figure 47) with a May - August peak, the species was rare or absent in the May - August period of 1994, 1997 and 1998. Moreover, they were common during summer in 6 of the 15 years, and rare or absent in the rest. Very low numbers seen in 1985 and 1994 suggest that this species may be adversely affected by fire, although there was no immediate recovery in 1995 as there was in 1986 (Figure 47). The distribution of Western Spinebills across Gooseberry Hill tended to favour areas of Wandoo.

The few nests found were in the foliage of Eucalypts or *Nuytsia floribunda* at a height of 5 to 12 m.

Fledglings were recorded from August to January. One male was observed building a nest in a *Nuytsia floribunda* on 20 August 1986. During a hide-watch at an Inland Thornbill nest on 17 August 1988, a female spinebill twice raided the nest, removing lining material which she carried to her own nest, and tossing an egg out of the thornbill's nest in the process. The thornbill's nest was subsequently deserted.

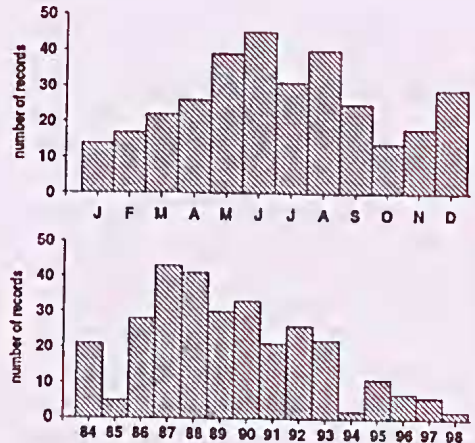


Figure 47. Number of records of Western Spinebills on Gooseberry Hill, according to month (top) and year (bottom).

Table 5. Observation histories of three male and three female colour-banded Western Spinebills at Marion Way (Landor Rd is 200 m south of Marion Way).

band	date	observation
OYO	8 March 1987	banded
(fem)	March 1987	seen
	April 1987	seen
	May 1987	seen
	September 1987	seen
	11 October 1987	seen with fledgling
YBR	3 February 1991	banded
(fem)	10 January 1993	retrapped
RBR	12 February 1995	banded
(fem)	1 February 1998	retrapped
	11-25 April 1998	seen
NGO	27 August 1994	banded
(male)	29 October 1994	seen with fledgling
	23 April 1999	seen Landor Rd
RYO	22 December 1995	banded
(male)	18 February 1996	seen Landor Rd
NOO	30 May 1993	banded
(male)	18 February 1996	seen Landor Rd
	26 May 1996	seen Landor Rd
	7 July 1996	seen Landor Rd
	5 October 1996	seen Landor Rd
	17 May 1997	seen Landor Rd
	17 January 1998	seen Landor Rd
	21 February 1998	seen Landor Rd
	7 March 1998	seen Landor Rd

Western Spinebills were seen foraging on flowering *Calothamnus hirsutus* in February and March; *C. sanguinius* in April and May; and *Grevillea bipinnata* in most months of the year. There were a number of records of Western Spinebills taking invertebrates from the trunks of Marri trees.

A total of 60 individuals were colour-banded. The longest time to resighting for a male was 57 months after banding,

and for a female, 50 months later. One banded pair nested on Gooseberry Hill in the breeding season following the 1985 fire. The male was again recorded in the same area in 1986 and 1987. Details of three males and three females banded at Marion Way are given in Table 5. Their pattern of resighting suggests an erratic presence; i.e. not seen at all in some years, nesting in other years. Of course, one explanation for this may be that their home range shifts from one year to the next.

Scarlet Robin *Petroica multicolor*

Scarlet Robins are resident breeders on Gooseberry Hill. Densities ranged from 4 to 7 pairs per 100 ha over 15 years. Numbers were highest in the period 1985 - 1989, following the 1985 fire, which suggests that they favour recently burnt habitat; although there was no increase in numbers after the 1994 fire (Brooker 1998).

Scarlet Robins nested in Marri trees (n = 10; nest height 2 - 12 m), Balgas

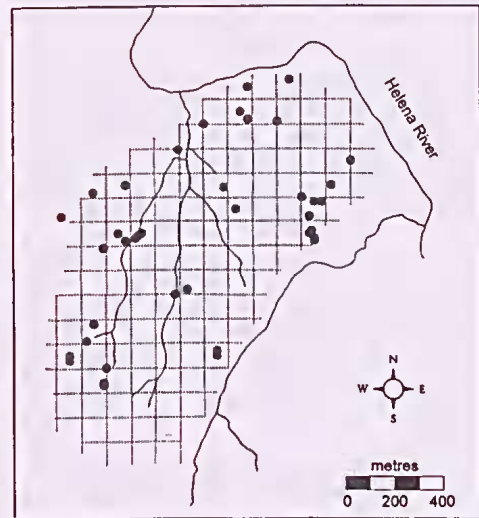


Figure 48. Locations of Scarlet Robin nests on Gooseberry Hill, 1984-1998.

Xanthorrhoea preissii (n = 9; 1.0 - 1.7 m) and *Nuytsia floribunda* (n = 1; 3.9 m). Nests in the forks of multi-headed Balgas were particularly well hidden by the skirt, even when the plant had been burnt the previous summer. The distribution of nesting sites is shown in Figure 48. Of 36 nesting attempts in which the outcome was known, four were parasitized by Horsfield's Bronze-Cuckoos, three in 1985 and one in 1987. Of 16 nests found with eggs or nestlings, eight fledged young robins or cuckoos.

Red-capped Robin *Petroica goodenovii*

The numbers of Red-capped Robins on Gooseberry Hill fluctuate considerably. They were numerous in the 12 months following each of the major fires in 1985 and 1994; seen occasionally in other years in the cleared country of the Lab grounds and Farrant's paddocks; and absent altogether in 1991, 1992 and 1998. Their appearance after fire has been reported from other areas near Perth, e.g. Pipidinny (WA Bird Notes 73: 8) and Ellis Brook (WA Bird Notes 74: 8).

Birds, mainly juveniles, were recorded most frequently in autumn (March to May). Similar observations were made by Green (1998) who observed a pair at Kelmscott in May; and Bremner (1996), who regularly observed a pair that visited Kalamunda National Park between late March and early May.

Some birds move toward the west coast in late summer and early autumn and return east in late autumn or winter (Storr 1991). However, if conditions are suitable, (e.g. after fire) some may remain all year.

Nesting was recorded from 1985 to 1988 and in 1990. One banded male was resident in the orchard at the Lab for two years from August 1987. He was accompanied by an unbanded female



Figure 49. Body mass and wing length for two known-age nestling Red-capped Robins.

and the pair presumably nested there. A pair of Scarlet Robins had a territory that overlapped that of the Red-capped Robins in both years. Growth curves for two nestlings are shown in Figure 49.

Hooded Robin *Melanodryas cucullata*

A female or juvenile Hooded Robin was seen on four occasions in 1987 between 24 September and 2 October.

White-breasted Robin *Eopsaltria georgiana*

First seen in the riverine habitat in May 1996. A single White-breasted Robin was seen in the same area in April 1998 and one was netted there in May 1998. Calls were heard in that area and elsewhere along the Helena River in September and October 1998, particularly those parts with Karri Hazel *Trymalium floribundum*, which is a favoured component of White-breasted Robin habitat in the South-West (Serventy & Whittell, 1976). Napier (1998) recorded White-breasted Robins on the river upstream of the picnic area (Figure 1) in June 1998. They nested in the riverine vegetation in 1999, where a pair were observed feeding a Pallid Cuckoo fledgling in November.

Varied Sittella *Daphoenositta chrysoptera*

At least two groups of Varied Sittellas

have been observed from time to time on Gooseberry Hill (170 records in 15 years). They were recorded most often from May to December (92% of records) and more frequently seen in areas with Wandoo or Flooded Gum than those with Marri trees. Weekly records for Marion Way show regular visits from February to August but very few in other months, presumably because they do not nest in suburbia.

Group size varied from 2 to 15; median group size for March - August, 5.5; other months 3.5. Fledglings were observed in November and December.

One group was seen "hawking" winged bullants at 1600 h on 21 July 1992. The birds flew out about 0.5 m from a 10 m perch to capture the ants.

Golden Whistler *Pachycephala pectoralis*

An uncommon winter visitor, Golden Whistlers were recorded on 54 occasions, 76% of these in June, July and August. Of 39 sightings of individuals, only two were in male plumage.

Rufous Whistler *Pachycephala rufiventris*

A common resident, present on all areas throughout the year. At Marion Way, recorded in all weeks. The Rufous Whistler appears to be a late nester in this area. Fledglings were seen only from November to February.

Four colour-banded males were resighted in the same area 19, 28, 38 and 38 months after banding and two females 19 and 36 months after banding.

Grey Shrike-thrush *Colluricincla harmonica*

Not common on Gooseberry Hill, with only 242 records made in 15 years; 95% of sightings were between May and

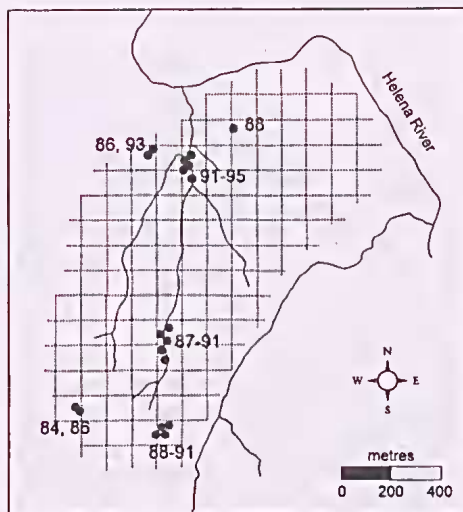


Figure 50. Spatial and temporal distribution of Grey Shrike-Thrush sightings on Gooseberry Hill.

December. The Grey Shrike-thrush was absent in areas burnt by the major fire in 1985 but present in the 1994 post-fire period. The spatial and temporal distribution of sightings (Figure 50) was clumped, suggesting that only one or two pairs made opportunistic use of the area in some years.

One adult female colour-banded at a nest on 13 December 1988 was resighted 400 m away on 27 June 1990 and again on 5 December 1990, 600 m from the nest area.

Four breeding records were made - a female carrying food on 8 October 1984; a nest with 3 eggs on 7 December 1988; a nest with 2 nestlings on 30 October 1993; one fledgling on 13 December 1991.

Restless Flycatcher *Myiagra inquieta*

A single bird was seen on 6 May 1991 on the south-western edge of Gooseberry Hill and at Marion Way.

Magpie-lark *Grallina cyanoleuca*

Recorded in riverine habitat and the cleared country adjoining it. Rare in the heathland, even after fire. Twenty-three records were made over 15 years, with only eight of these in areas away from the Helena River. Nest building was observed between 30 August and 19 October at the Lab. The earliest fledglings were seen on 23 September; the latest on 8 January.

Grey Fantail *Rhipidura fuliginosa*

Common on Gooseberry Hill, where the number of sightings peaked in March every year. Fewer birds were recorded after August, with only one observation made in October from areas other than the vegetation along the Helena River, the only habitat where breeding was recorded.

Birds were found building on 12 September and 30 September; nestlings recorded from 26 September to 3 December ($n = 6$); fledglings recorded from 3 November to 31 December ($n = 6$).

Three of six adults colour-banded were resighted at the banding site. One individual banded on 17 June 1987 was seen 11 months later, one banded on 26 January 1990 was seen again on four occasions up to 4 months after banding, and another banded on 9 March 1990 on two occasions up to 8 months later.

Willie Wagtail *Rhipidura leucophrys*

Seen occasionally on Gooseberry Hill (43 records), usually in areas adjoining either the river or the cleared country. There appeared to be no seasonal variation in occurrence and no detectable changes after fire. Willie Wagtails were present in the grounds of the Lab throughout the period of study and nested there. The earliest breeding record was 28 August (building); latest 16 November (nestlings fledged).

Of six Willie Wagtails colour-banded at the Lab, three were resighted: one for 3 months at the Lab; one for 51 months at the Lab; and a third individual for 14 months at the Lab and thereafter for another 12 months, 1 km away in a semi-urban area on the opposite side of the river. A sheep that strayed onto Gooseberry Hill in April 1987 was accompanied by a Willie Wagtail.

Black-faced Cuckoo-shrike *Coracina novaehollandiae*

Present on Gooseberry Hill throughout the year. Flocks, consisting mainly of adults, were recorded in May and June. Juveniles were recorded from October onwards, mainly between November and January. Nests with young were found on 7 November 1986, 19 November 1987 and 11 December 1992.

White-winged Triller *Lalage sueurii*

A common breeding species on Gooseberry Hill in some years; rare or absent in others; only one record in 1996, none in 1998. The earliest date of arrival was 26 July 1987, the latest departure date 3 March 1987 (Figure 51). White-winged Trillers were most abundant in the years after the 1985

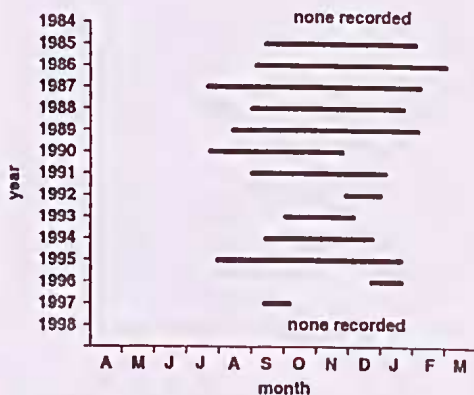


Figure 51. Length of stay of White-winged Trillers at Gooseberry Hill, 1984-1998.

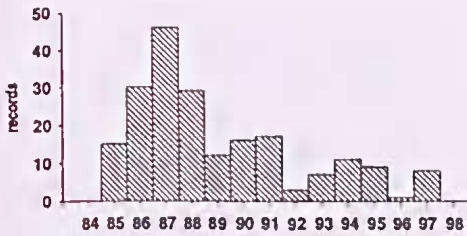


Figure 52. Number of records of White-winged Trillers on Gooseberry Hill, 1984-1998.

fire, although there was no similar influx and no nest records after the 1994 fire (Figure 52).

Breeding was recorded from September to December; most fledglings were seen in December.

Masked Woodswallow *Artamus personatus*

Flocks of Masked Woodswallow were seen on Gooseberry Hill on four occasions: 18 and 28 September 1985, 22 October 1990 and 10 October 1994. Similar sightings were not recorded in WA Bird Notes for other parts of the Perth area.

Dusky Woodswallow *Artamus cyanopterus*

Dusky Woodswallows were rare on Gooseberry Hill in the two years prior to the January 1985 fire (I. Rowley per. comm.). In the following eight years, they increased in numbers, with a peak density in the breeding season following the 1987 fire (Figure 53). During this period (1985-1992) they were present throughout the year. Of the five nests found in later years (1990 and 1991), four were in or near a small area burnt in January 1990. These records suggest a positive response to fire by this species, although few birds were seen in the five years after the February 1994 fire and those that were seen did not stay throughout the year.

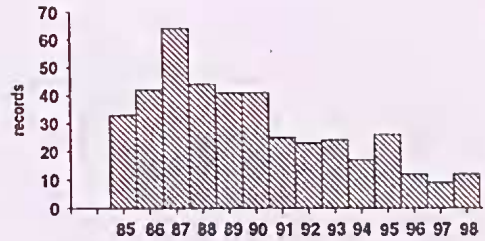


Figure 53. Numbers of Dusky Woodswallow records on Gooseberry Hill, 1984-1998.

The locations of nests (Figure 54) were clumped, although there were no obvious vegetation or landscape attributes which might explain this. Nests were built in trees and Balgas *Xanthorrhoea preissii* (Appendix 3); median height 4.0 m (n = 20); range 1.2 - 10 m. For 20 nests with detailed observations, clutch size was 3 (n = 6) or 4 (n = 2); 11 (55%) fledged young; at 16 nests there were 2 adults present; at four nests, at least 3 adults. Two groups in 1985 renested with at least one of the previous brood surviving. In one case the renesting interval was 51 d (hatch to hatch), in the other 65 d

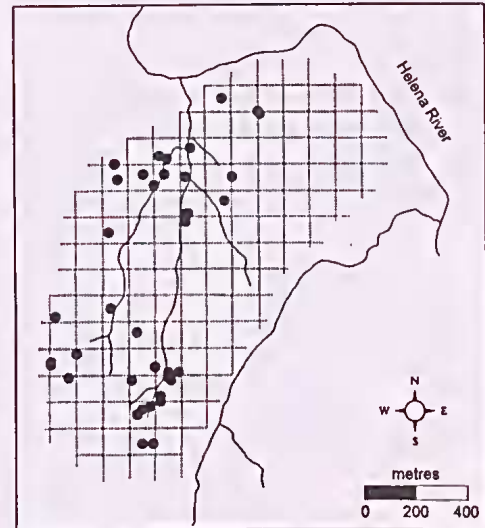


Figure 54. Locations of Dusky Woodswallow nests on Gooseberry Hill, 1984-1998.



Figure 55. Body mass and wing length for known-age nestling Dusky Woodswallows (n = 1-5).

(fledge to fledge). Growth curves for nestlings are shown in Figure 55.

A total of 21 adults were colour-banded. Most were resighted on Gooseberry Hill and most nested there. Over a seven year period, one male was present at nests in 1986, 1987, 1989, 1990 and 1992. He was observed copulating on one occasion.

Of the 29 colour-banded nestlings, 10 were seen again on Gooseberry Hill on one or more occasions and one was found dead 1.1 km from its nest site, 9 months after banding. Another juvenile was caught in a chicken coop 1.5 km south-west of its nest site 6 weeks after banding.

Grey Butcherbird *Cracticus torquatus*

The Grey Butcherbird was common on the farming and urban edges of Gooseberry Hill, but was rare and did



Figure 56. Body mass and wing length for 3 nestling Grey Butcherbirds.

not nest in the undisturbed native vegetation of the central area.

Eggs were laid from late September to mid October (n = 4) and young fledglings were recorded as late as mid February (n = 1). One nestling colour-banded on 22 October 1986 was resighted 18 months later, 200 m from the nest. Growth curves for nestlings are shown in Figure 56.

Australian Magpie *Gymnorhina tibicen*

Found throughout Gooseberry Hill, throughout the year. Sixty-eight of the records were for one pair of Magpies that were banded in January 1986 and were subsequently resighted every year thereafter until October 1988, when the female disappeared, and the male until January 1993 (7 years after banding) (Figure 57). Thirty-one (46%) of these sightings were made at carparks on the Zig Zag Road.

Nests were built from 1 August onwards; young fledglings seen mostly in October and November, latest 2 December.

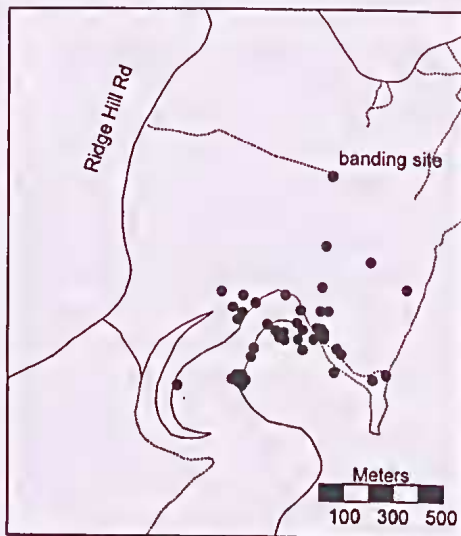


Figure 57. Locations where one pair of Australian Magpies were resighted, the male for 7 years after banding.

Unlike Australian Ravens (see below), magpies chased and harassed diurnal raptors throughout the year (Table 6).

Australian Raven *Corvus coronoides*

Ravens were common on all areas throughout the year. In January and February they formed flocks of up to 20 birds comprised mostly of juveniles. From late May to August noisy groups of 4 to 10 were seen flying apparently aimlessly. The composition of these groups was not ascertained and their purpose is unclear - Rowley (1973) recorded courtship flights but these involved only the resident pair.

Nest building was recorded as early as 22 June; earliest fledglings 16 September; latest fledglings 27 November. Most harrying by ravens of diurnal raptors (97%) occurred during the breeding season (August to November), despite the presence of raptors throughout the year (Table 6). Rowley (1973) reported a broader period for raptor harrying of Wedge-tailed Eagles near Canberra (April - September), although 77% of his records were for the main breeding season in that region (July to September).

Little Crow *Corvus bennetti*

Transit flocks of Little Crows were recorded by Serventy during the period 1957-1974. I. Rowley (pers. comm.) trapped 222 individuals near Midland between January 1972 and March 1974. The only record since then was of seven birds at Gooseberry Hill on 25 March 1987 (Smith 1987).

Richard's Pipit *Anthus novaeseelandiae*

Recorded on four occasions along road verges, once in June and September and twice in October.

Red-browed Finch *Neochmia temporalis*

Red-browed Finches were introduced to Western Australia unintentionally as aviary escapees and had become well established in the Kalamunda area by 1958 (Dell 1965). They were present on Gooseberry Hill and nested there in the late 1980s and early 1990s. A peak in numbers was recorded 1986 and 1987 following the major fire of 1985. After 1991, their numbers declined, with only one sighting since the 1994 fire up until August 1998, when several birds were seen on the northern edge of

Table 6. Numbers of raptors harried by Australian Magpies and Australian Ravens on Gooseberry Hill, 1984-1998.

harrying species	harried raptor	M	A	M	J	J	A	S	O	N	D	J	F
Australian Magpie	Little Eagle	1		1	1	1	3	8	3	3	1	1	
	Wedge-tailed Eagle	1				1							
	Square-tailed Kite							1					1
	Accipiter sp.		1	2				2	1			1	
	Total	2	1	3	1	2	3	11	4	3	1	2	1
Australian Raven	Little Eagle						7	18	10	5			
	Wedge-tailed Eagle					1	5	2	1		1		
	Square-tailed Kite						1	1					
	Accipiter sp.						2	4					1
	Total					1	15	25	11	5	1		1

Gooseberry Hill on four occasions. One possible cause of their decline could be trapping for aviculture. Seen most frequently along the Helena River or nearby (70% of records), occasionally all over Gooseberry Hill.

Nests were found in a variety of trees and shrubs (Appendix 3).

Three colour-banded individuals were resighted on the area 2, 11 and 33 months after banding.

Red-eared Firetail *Stagonopleura oculata*

Not seen on Gooseberry Hill until January 1988, although P. Hussey (pers. comm.) told me they were common along Helena River prior to the 1985 fire. Subsequently seen occasionally, but not in summer and rarely in the riverine habitats. One or more pairs were seen consistently in the central area during the winter and spring of 1997 and 1998 and most probably nested there.

Mistletoebird *Dicaeum hirundinaceum*

Most records from Gooseberry Hill were of birds in transit, probably because the high fire frequency had reduced the number of mistletoe plants on the area. An exception was the period March to July 1994, when they were seen taking fruit from mistletoe *Amyema preissii* growing on *Acacia saligna* on the northern edge of the area. Mistletoebirds were more frequently seen in suburbia and at the Lab, usually between February and August. At Marion Way, two adults were seen feeding a fledgling on 22 September 1993; and a female was observed feeding a young fledgling on 20 April 1998.

Welcome Swallow *Hirundo neoxena*

The Welcome Swallow is a regular late-autumn to early-winter visitor to Gooseberry Hill (Figure 58). The two

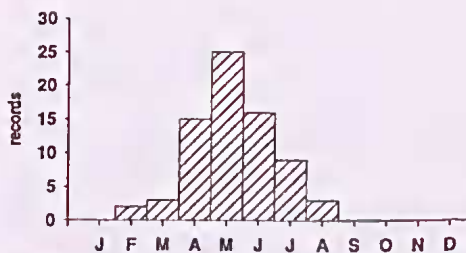


Figure 58. Number of records for Welcome Swallows on Gooseberry Hill, 1984-1998.

February records were made in 1985, soon after the fire of 30 January. At a small reserve surrounded by suburbia at Forrestfield, they were seen in all months of the year except February (Mawson and Massam 1995).

Tree Martin *Hirundo nigricans*

Recorded in all months foraging over all habitats. Nesting activity was recorded from August (building) to December (feeding nestlings). Tree Martins on Gooseberry Hill seem to favour nest hollows in Wandooos (9) rather than those in Marris (2). They also nested in *Eucalyptus rudis* along the Helena River.

Rufous Songlark *Cincloramphus mathewsi*

Recorded on 19 occasions in eight of 15 years. Most records were of single birds seen in December, January or February. Birds were seen outside these months only in the two years following the 1985 fire (Sept and Oct).

Silvereye *Zosterops lateralis*

The abundance of Silvereyes on Gooseberry Hill varied within and between years, although some birds were always present. They appeared to most numerous late-autumn to early-winter; least numerous in summer. They were present following fire, feeding on the resprouting foliage on eucalypts and shrubs such as *Dryandra armata*.

AVIARY ESCAPEES

Budgerigah *Melopsittacus undulatus*

One pale blue individual on Gooseberry Hill on 30 December 1985; one yellow bird at the Lab on 4 May 1992.

Canary

One light tangerine-coloured Canary on 18 September 1985.

Cockatiel *Nymphicus hollandicus*

One individual on 13 January 1991.

Crested Pigeon *Ocyphaps lophotes*

One individual in the old stables at the Lab on 23 May 1991.

Diamond Dove *Geopelia cuneata*

One individual near Helena River on 13 November 1994

Diamond Firetail *Stagonopleura guttata*

A pair of Diamond Firetails was seen on Gooseberry Hill on 8 December 1987. On 19 December a pair was seen feeding a fledgling (black bill, yellowish gape) in the same area. There were no further sightings of this species after 20 December. It seems likely that the pair (red bills) were escapees that bred in the wild.

Zebra Finch *Taeniopygia guttata*

Observed on two occasions, June 1988 and March 1989.

DISCUSSION

I recorded a total of 103 avian species, of which 12 were waterbirds. Eight of the 91 landbirds were introduced species, and a further seven were most probably aviary escapees. Although Dell (1983) lists 100 species for the Darling Scarp, there are considerable differences between the two lists. Of the species I

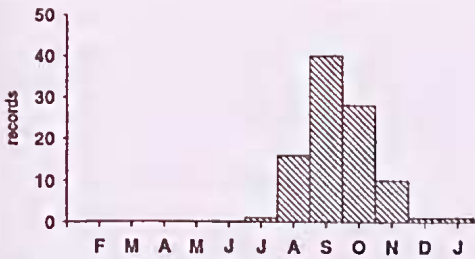


Figure 59. Distribution of 96 breeding records for Silvereyes on Gooseberry Hill, 1984-1998.

Nesting was recorded from 29 July (earliest) to 30 December (latest), with most nests and young recorded in September (Figure 59). Nests were built in Marri trees, Wandooos, vines and several species of shrubs (Appendix 3); median height above ground 1.0 m (n = 31); range 0.4 - 6.0 m. Growth curves for nestling Silvereyes are shown in Figure 60.

Silvereyes, along with Brown Honeyeaters, were observed taking nectar from *Watsonia* flowers by piercing the lower portion of the floral tube. Most flowers examined had a neat 5 mm slit near the proximal end.

A total of 190 adults and 75 nestlings were banded and 20 adults were retrapped at least once, all within 400 m of their banding site, up to 6 years later. Two banded in January 1991 were caught together at the same net line in July 1995.



Figure 60. Body mass and wing length for known-age nestling Silvereyes (n = 1-8).

recorded at Gooseberry Hill, 22 were not on Dell's list and 18 species on his list were not seen on Gooseberry Hill. However, these discrepancies were mainly due differences in the numbers of waterbirds and vagrants.

I have no records for four species that I had expected, either because they had been previously recorded in the area or because the habitat appeared suitable—the Whistling Kite was recorded by Serventy as “not often seen”; the Australian Hobby might have been expected, although Serventy recorded it only twice in 16 years (June 1965, November 1971); Southern Emu-wrens are found on the scarp 5-10 km south of Gooseberry Hill in apparently similar habitat which is also frequently burnt. The scarp at Gooseberry Hill does not closely abut Swan Coastal Plain vegetation as it does further south (e.g. at Gosnells), which could explain, in part, the absence of emu-wrens from Gooseberry Hill; Little Crows were recorded by Serventy at the Knoll and were present in the Helena Valley-Midland area in the 1970s (I. Rowley pers. comm.). The only recent record for the area was by Rod Smith who saw seven on 25 March 1987 (WA Bird Notes 42: 3).

Forty-four species were recorded nesting on Gooseberry Hill and a further eight species probably did so. Of raptors, only the Brown Goshawk nested; the proximity of suburbia may have inhibited others such as Wedge-tailed Eagles.

For six species, the numbers of breeding birds on Gooseberry Hill usually increased in the year or years immediately post-fire (Little Button-Quail, Elegant Parrot, Yellow-rumped Thornbill, Red-capped Robin, White-winged Triller, Dusky Woodswallow). In other species (Fan-tailed Cuckoo,

White-browed Scrubwren, Inland Thornbill, Western Thornbill, White-cheeked Honeyeater) the numbers breeding in post-fires years declined to just a few or none in the burnt areas.

A number of species that did not breed on Gooseberry Hill, foraged there - Short-billed Black-Cockatoos, Western Rosellas, Yellow-plumed Honeyeaters and Brown-headed Honeyeaters in some years; and Golden Whistlers, Grey Fantails and Welcome Swallows every year. None of these appeared to be affected by fire. However the frequent fires have probably contributed to the scarcity of Mistletoe on the area and the subsequent uncommon status of the Mistletoebird there.

The suite of sedentary species found today on Gooseberry Hill obviously cope with the high fire frequency of the present landscape. However, the long-term persistence of Splendid Fairy-wrens relies on the continued connectivity of the area to other similar habitat (Brooker and Brooker 1994a). The same scenario probably applies to the other heathland species.

Some species such as Western, Inland and Yellow-rumped Thornbills appear to be declining in numbers on Gooseberry Hill, although their densities have not fluctuated as much as for Splendid Fairy-wrens.

Two species which appear to have declined most markedly during the last 15 years are the Owlet- Nightjar (perhaps due to loss of hollows after the hot fires of 1985 and 1987) and the introduced Red-browed Finch (perhaps due to trapping for aviculture).

Another major factor that might affect the future survival of the Gooseberry Hill avifauna is the continuing spread of exotic plant species, such as *Watsonia* (*Watsonia* spp.), which has the capacity

to become a monoculture in the species-rich gullies and winter-damp habitats.

Gooseberry Hill is of considerable scientific and intrinsic conservation value. Its scientific value lies in the existence of long-term datasets of faunal and floral abundances and distributions and fire history. Intrinsically, this area of the Darling Scarp represents the only major connection between the last large remnant of Ridge Hill Shelf landform (only 9% not alienated) and the forests of Kalamunda National Park.

POSTSCRIPT

Observations on Gooseberry Hill since 1998 have continued. Splendid Fairy-wren density remained static in 1999 (53 adults per 100 ha) and increased to 60.6 in 2000, which is about half the peak densities recorded in the mid 1980's (see Figure 20).

A hot fire deliberately lit on 20 December 2000 burnt about 60% of the study area.

REFERENCES

ASHTON, C.B. 1987. The breeding of birds in the Aldinga Scrub Conservation Park, South Australia. *Australian Bird Watcher* 12: 73-82.

BREMNER, M. 1996. Robins at Kalamunda WA *Bird Notes* No. 78: 17.

BROOKER, M.G. 1987. Sacred Kingfisher snared by Dodder. *Western Australian Naturalist* 17: 24.

BROOKER, M.G. 1998. Fire and birds in Western Australian heathland. *Emu* 98: 276-287.

BROOKER, M.G. and BROOKER, L.C. 1989. The comparative breeding behaviour of two sympatric cuckoos,

Horsfield's Bronze-Cuckoo *Chrysococcyx basalis* and the Shining Bronze-Cuckoo *C. lucidus*, in Western Australia: a new model for the evolution of egg morphology and host specificity in avian brood parasites. *Ibis* 131: 528-547.

BROOKER, M.G. and BROOKER, L.C. 1992. Evidence for individual female host specificity in two Australian bronze-cuckoos (*Chrysococcyx* spp.). *Australian Journal of Zoology* 40: 485-493.

BROOKER, M.G. and BROOKER, L.C. 1994. Fan-tailed Cuckoo, Horsfield's Bronze-Cuckoo. In R. Strahan, editor. *Cuckoos, Nightbirds and Kingfishers of Australia*. pp 19, 25. Angus & Robertson, Sydney.

BROOKER, M.G. and I. ROWLEY. 1995. The significance of territory size and quality in the mating strategy of the splendid fairy-wren. *Journal of Animal Ecology* 64: 614-627.

BROOKER, M.G. and ROWLEY, I. 1991. Impact of wildfire on nesting behaviour of birds in heathland. *Wildlife Research* 18: 249-263.

DELL, J. 1965. The Red-browed Finch *Aegintha temporalis* in Western Australia. *Western Australian Naturalist* 9: 160-169.

DELL, J. 1971. Breeding of a Little Eagle in the Darling Range. *Western Australian Naturalist* 11: 186-187.

DELL, J. 1983. The importance of the Darling Scarp to fauna. In J.D. Majer, editor. *Scarp Symposium*. Report No 10. pp. 17-27. Environmental Studies Group, WAIT.

GREEN, M. 1998. Red-capped Robins in Kelmscott. *Western Australian Naturalist* 22: 135.

HIGGINS, P 1999. editor. *Handbook of Australian, New Zealand and Antarctic*

- Birds. Vol IV. Oxford University Press, Oxford.
- HOYT, D.F. 1979. Practical methods of estimating volume and fresh weight of birds eggs. *Auk* 96: 73-77
- HUSSEY, B. M. J. 1993. Naturalised plants of the southern slopes of the western end of the Helena Valley, Western Australia. *Western Australian Naturalist* 19: 219-240.
- JOHNSTON, R.E. and G.M. STORR. 1999. *Handbook of Western Australian Birds*. Vol I. Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth.
- MAWSON, P.R. and M.C. MASSAM. 1995. The birds of a remnant of native vegetation on the eastern Swan Coastal Plain. *Western Australian Naturalist* 20: 37-47.
- NAPIER, W. 1998. Helena Valley, 6 June. *WA Bird Notes* 87: 27
- QUICKE, E. 1979. *Pioneers of the Helena*. Perth.
- RIDPATH, M.G. and M. BROOKER. 1986. Age, movements and the management of the Wedge-tailed Eagle, *Aquila audax*, in arid Western Australia. *Australian Wildlife Research* 13: 245-260.
- ROWLEY, I. 1973. The comparative ecology of the Australian corvids. II. Social organization and behaviour. *CSIRO Wildlife Research* 18: 25-63.
- ROWLEY, I and M. BROOKER. 1987. The response of a small insectivorous bird to fire in heathlands. In D. Saunders, G. Arnold, A. Burbidge, A. Hopkins eds. *Nature Conservation: the Role of Remnants of Native Vegetation*. pp 211-218. Surrey Beatty and Sons, Sydney.
- ROWLEY, I., M. BROOKER and E. RUSSELL. 1991. The breeding biology of the Splendid Fairy-wren *Malurus splendens*: the significance of multiple broods. *Emu* 91: 197-221.
- SEDGWICK, E.H. 1954. Bird-life at Woorooloo. *Western Australian Naturalist* 5: 63-70
- SEDGWICK, E.H. 1971. Movements of *Pardalotus substriatus*, Red-tipped Pardalote, in Western Australia. *Western Australian Naturalist* 12: 1-4
- SERVENTY, D.L. and H.M. WHITTELL. 1976. *Birds of Western Australia*. UWA Press, Perth.
- SMITH, R. 1987. Observations. *WA Bird Notes* 42: 3
- STEELE, K. 1993. *Zig Zag to Kalamunda*. Drillmark Publications Division, Lesmurdie.
- STORR, G.M. 1991. Birds of the South-West Division of Western Australia. *Records of Western Australian Museum*. Supplement No 35.
- WYKES, B.J. 1985. The Jarrah forest avifauna and its re-establishment after bauxite mining. *Biology Bulletin* No 12. School of Botony, WAIT.

Appendix 1. Morphological measurements (wing = length of folded wing, maximum chord; tail = length of central rectrix; both measured to nearest 0.1 mm)

species	sex	body-mass (g)					wing (mm)					tail (mm)				
		n	mean	std	min	max	n	mean	std	min	max	n	mean	std	min	max
Horsfield's Bronze-Cuckoo Shining Bronze-Cuckoo Striated Pardalote White-browed Scrubwren	U	5	21.2	1.6	19.8	24.1	5	102.2	5.3	95	111	5	70.6	2.6	67	74
	U	6	22.6	1.0	21.1	24.0	7	105.4	3.5	101	111	6	67.7	3.1	64	74
	U	16	10.4	0.8	9.2	13.0	16	62.0	1.1	59	64	13	31.3	1.0	29.5	33
	F	11	10.5	0.5	9.6	11.4	11	50.9	1.6	49	55	11	45.3	1.9	42	49
	M	12	11.4	0.5	10.7	12.7	12	53.8	1.9	50.5	58	12	48.3	2.0	45	52
Weebill	U	10	5.6	0.3	5.0	6.0	10	49.1	1.3	47	51	8	33.9	1.0	32	35
Western Gerygone	U	9	6.1	0.4	5.0	6.8	9	55.9	1.4	54	59	9	43.6	1.3	42	45.5
Inland Thornbill	F	4	7.3	0.2	6.5	7.1	4	49.2	1.0	48	50	4	45.2	1.3	44	47
	M	4	7.3	0.2	7.0	7.6	4	52.0	0	52	52	4	47.4	0.8	46	48
Western Thornbill	U	308	7.01	0.41	6.0	9.3	298	47.75	1.63	44.0	52.5	215	35.9	1.8	32	47
Yellow-rumped Thornbill	U	41	9.16	0.43	8.2	9.9	40	58.16	1.72	55	61	35	40.6	2.0	37	45
Brown Honeyeater	F	9	9.39	0.63	8.4	10.7	9	58.6	1.7	55	60.5	7	45.6	3.7	40	50
	M	22	11.52	0.59	10.3	12.5	21	66.5	1.8	63.5	69.5	20	53.5	1.5	50	56
Tawny-crowned Honeyeater	F	8	15.9	0.7	15.0	17.0	8	72.8	1.1	71.5	75	7	59.4	3.0	55	64
	M	4	17.1	1.1	15.5	18.4	4	78.2	2.6	74	81	3	65.0	0.8	64	66
Western Spinebill	F	9	9.1	0.6	7.9	10.2	9	57.1	1.2	55	59	9	51.5	2.7	45	54
	M	23	10.7	0.9	9.3	12.5	23	61.5	1.8	58	65	20	56.5	2.2	53	60.5
Scarlet Robin	F	2	13.7	-	13.7	13.8	2	69.5	-	69	70	2	47.8	-	47	48
	M	7	12.4	0.7	11.5	13.6	7	71.3	1.4	69	73	7	50.6	2.2	47	54
Red-capped Robin	U	9	8.3	0.4	7.6	9.0	9	60.2	1.9	57	63	8	43.8	1.2	41.5	45
Rufous Whistler	F	2	26.2	-	25.4	27.0	2	91.0	-	90	92	2	67.0	-	65	69
	M	7	26.3	1.9	24.2	29.5	7	94.9	1.6	92	97	6	67.0	4.5	59	73
Grey Fantail	U	11	8.1	0.5	7.1	8.9	12	71.2	1.9	68	74	11	85.3	3.4	79	91
Willie Wagtail	U	4	20.2	1.4	18.6	21.7	4	97.5	3.2	93	101	4	104.0	3.4	99	108
Dusky Woodswallow	U	19	34.0	2.1	30.1	37.7	20	122.8	4.0	117	135	18	68.4	2.5	64	73
Red-browed Finch	F	3	10.4	0.6	9.5	11.0	3	50.5	1.5	48.5	52	3	43.8	2.7	41	47.5
Mistletoebird	M	5	10.0	0.8	8.9	11.2	4	63.0	0.7	62	64	3	29.8	0.8	29	31
Silvereye	U	62	9.35	0.5	8.3	10.9	42	55.0	1.6	52	60	41	43.7	1.8	40	48

Appendix 2. Egg measurements (egg volume calculated from measurements using the formula $V = 0.51 L B^2$, where L is length, and B is breadth (Hoyt 1979)).

species	n	length (mm)			breadth (mm)			volume (ml)					
		mean	std	min	max	mean	std	min	max	mean	std	min	max
Little Button-quail	1	23.0	-	-	-	18.8	-	-	4.14	-	-	-	-
Fan-tailed Cuckoo	1	21.5	-	-	-	13.7	-	-	2.06	-	-	-	-
Horsfield's Bronze-Cuckoo	25	17.7	0.9	16.4	19.5	12.0	0.5	11.2	1.32	0.12	1.11	13.4	1.54
Shining Bronze-Cuckoo	14	17.7	1.0	15.5	19.4	12.4	0.6	11.5	1.39	0.19	1.04	13.5	1.72
Splendid Fairy-wren	79	16.4	0.5	15.6	18.0	12.4	0.4	11.6	1.34	0.10	1.15	13.3	1.56
Inland Thornbill	2	16.8	-	16.7	16.8	12.5	-	12.5	1.33	-	1.33	12.5	1.34
Western Thornbill	50	16.7	0.5	15.4	17.8	12.7	0.4	11.5	1.37	0.11	1.06	13.5	1.65
Yellow-rumped Thornbill	16	17.3	0.7	15.9	18.5	12.3	0.2	11.9	1.33	0.09	1.18	12.8	1.50
Brown Honeyeater	4	18.0	0.7	17.2	19.1	12.5	0.2	12.3	1.44	0.06	1.37	12.8	1.55
New Holland Honeyeater	6	21.0	0.7	19.9	21.8	15.1	0.4	14.7	2.45	0.19	2.19	15.9	2.69
Tawny-crowned Honeyeater	5	21.2	1.4	19.5	23.1	14.8	0.6	13.6	2.39	0.29	1.84	15.4	2.64
Dusky Woodswallow	2	23.6	-	23.4	23.8	17.0	0.4	16.5	3.46	-	3.25	17.4	3.67
Red-browed Finch	1	14.7	-	-	-	10.6	-	-	0.84	-	-	-	-
Silvereye	7	16.7	0.6	15.8	17.4	12.0	0.2	11.8	1.24	0.06	1.12	12.2	1.30

Appendix 3. Number of nests found in each plant species 1984-1998

	Laughing Turtle-Dove	Galah	Splendid Fairy-wren	White-browed Scrubwren	Weebill	Western Gerygone	Inland Thornbill	Western Thornbill	Yellow-rumped Thornbill	Brown Honeyeater	White-cheeked Honeyeater	Tawny-crowned Honeyeater	Scarlet Robin	Grey Fantail	Dusky Woodswallow	Red-browed Finch	Silvereye
<i>Pteridium esculentum</i>							1		3								
<i>Macrozamia riedlei</i>			8						1								1
<i>Tetrarrhena laevis</i>			1														
<i>Desmocladius</i> sp.				1													
<i>Kingia australis</i>								3									
<i>Xanthorrhoea preissii</i>	1		9	3			236	17	7	3	1	9			2	3	3
<i>Dioscorea hastiflora</i>							1	3	1	1							6
<i>Styandra glauca</i>			1														
<i>Watsonia</i> sp.									3								
<i>Allocasuarina humilis</i>			1					1			1						1
<i>Dryandra armata</i>			63					1	3	1	16						
<i>Dryandra sessilis</i>	1		2					1	8							1	
<i>Dryandra nivea</i>			1	2								1					
<i>Grevillea bipinnatifida</i>			1														
<i>Grevillea endlicherana</i>			2									6					
<i>Grevillea pilulifera</i>			1									1					2
<i>Hakea cristata</i>			23						6	1							
<i>Hakea erinaceae</i>			25	1			1										
<i>Hakea incrassata</i>			4														
<i>Hakea lissocarpha</i>			36	2			2	32	12	5	1	3				2	12
<i>Hakea prostrata</i>									1								
<i>Hakea trifurcata</i>			1							1							
<i>Hakea undulata</i>																2	
<i>Isopogon dubius</i>			5														
<i>Petrophile biloba</i>			1							1							
<i>Synaphea acutiloba</i>												2					
<i>Synaphea pinnata</i>										1							
<i>Nuytsia floribunda</i>								2	24				1		7	1	
<i>Acacia pulchella</i>			142				1			7	2						16
<i>Acacia saligna</i>			3						1							4	
<i>Acacia sessilis</i>			1														
<i>Labichea lanceolata</i>			1														
<i>Daviesia horrida</i>			16							1							
<i>Nemcia spathulata</i>			1														
<i>Hovea pungens</i>			1														
<i>Jacksonia sternbergiana</i>								1	1							1	
<i>Lupinus</i> sp.			2														

	Laughing Turtle-Dove	Galah	Splendid Fairy-wren	White-browed Scrubwren	Weebill	Western Gerygone	Inland Thornbill	Western Thornbill	Yellow-rumped Thornbill	Brown Honeyeater	White-cheeked Honeyeater	Tawny-crowned Honeyeater	Scarlet Robin	Grey Fantail	Dusky Woodswallow	Red-browed Finch	Sil- verebe
<i>Trymalium ledifolium</i>			1				1		1		1						5
<i>Lasiopetalum bracteatum</i>									1								
<i>Hibbertia commutata</i>									1								
<i>Hibbertia hypericoides</i>			6									2					
<i>Thomasia foliosa</i>			2														
<i>Beaufortia purpurea</i>			4							1		1					1
<i>Calothamnus quadrifidus</i>			63	2			3	1	1	1	1						1
<i>Corymbia calophylla</i>	2	3	8	1	1	7	58	76	7				10	3	21	3	6
<i>Eucalyptus rudis</i>		1				1			5					1			
<i>Eucalyptus wandoo</i>	1	10	13		6	1	1	32	60	1					7		5
<i>Hypocalyma angustifolium</i>			1														
<i>Leptospermum erubescens</i>			3				1										
<i>Melaleuca radula</i>			1														
<i>Melaleuca raphiophylla</i>	1						1	4	8	1				1		1	
<i>Melaleuca scabra</i>												1					
<i>Leucopogon pulchella</i>			2														
<i>Hemigenia incana</i>												1					
TOTAL	6	14	455	12	7	9	13	375	219	49	9	37	20	5	37	18	59